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OVERHEAD LINES AT FIRES.

The control of central-station distribution circuits at fires is one of the most important problems of electrical service, and in the interests of safety to fire-department workers and to the community at large the responsibility for such action should be clearly defined and agreed upon by companies and municipalities. It is obvious that local ordinances bearing upon this subject may vary widely. The two fundamental requirements are safety and the maximum continuity of service. To some degree these are opposed, but we believe that few managers will hesitate when the choice comes between "killing" a limited section of distribution circuits and imperilling life. He should certainly shut off the current from specified lines upon request of the proper authority. Just what this authority shall be and the extent to which his orders shall be enforced should be agreed upon by the central station and the city in perfectly definite terms, seeking to give the former reasonable treatment and the latter the largest possible measure of safety both on private property and on the public streets.

In some cases where the understanding between city and company has not been clear, unfortunate results have occurred, but the company has had rather the better of the situation. At Fresno, Cal., a few years ago, a fireman lost his life by coming in contact with fallen wires in a shop yard. Suit was instituted against the local central station, the San Joaquin Light & Power Company, on the ground of negligence. It was claimed that ample notification and time were given for the cutting off of service, but the court held (158 Cal., 579) that a central station whose distributing system was so arranged that shutting off current would leave a large portion of the city without electricity at night, was not under obligation, merely because it had acquired information that a fire had started somewhere within one of the fire districts into which the city was divided, to cut off current supplying that portion of the city in which the fire was situated; that in the absence of an ordinance imposing the duty, negligence is not imputable to the company because it did not have an employee at the fire charged with the duty of disconnecting particular wires or signalling for the disconnections of the district; that the fact that employees of the lighting company were at the fire merely as onlookers, and observed that the

wires connected with the burning building were alive, but did nothing, cannot be imputed as negligence of the company; and that the utmost which can be exacted of electric lighting companies in such regard is that they shall hold themselves in readiness to cut off current when the necessity arises and they are informed of it by proper authority.

In matters of this kind it is gratifying to see that the easy habit of making the central station the target for successful casualty suits is likely to be frowned upon by the courts. The careless handling of overhead lines by firemen, or the use of ladders of the extension type with metallic fittings through which ground connections may be made, have had disastrous results in the past, and the proper treatment of the situation is clearly one demanding the seasoned judgment of the city official in charge, whether he be the municipal electrical engineer or the fire department officer in command of the force on the ground. Where the cutting of wires or the opening of circuits is done by central-station linemen working under the legal orders of the city authorities, the maximum safety is probably to be had; but too much emphasis cannot be laid upon the establishment of responsibility by ordinance after mutual agreement of city and company as a basis for harmonious and efficient co-operation.

THE MICHIGAN CONVENTION.

The annual convention of the Michigan Section, National Electric Light Association, which was held at Ottawa Beach last week, may well be considered the most successful so far held by that association. The meeting was somewhat of a departure from the two previous conventions, which were held aboard ship, and afforded a means of directly comparing the attitude of the members towards land and water meetings. It was evident from the registration that, after discounting for natural growth, a larger attendance could be expected at meetings on land than aboard ship, and while the greater number of diversions may have militated against a full attendance at each individual session, the greater registration held the average at each session far in excess of the previous conventions.

The session on Wednesday morning was the banner one of the convention. Seldom, if ever, has a state association been able to present to its members such a notable array of papers as those read at this session, and Secretary Silvester is to be congratulated on gathering together such a galaxy of notables as those who addressed the meeting at this session. Public policy and commission regulation were the topics discussed and the speakers included Hon. Lawson T. Hemans, of the Michigan Railroad Commission; Mr. J. V. Oxtoby, a prominent utility attorney; Secretary T. C. Martin of the National Electric Light Association; Mr. William J. Norton, rate expert; and Mr. Richard L. Drake, secretary of the State Industrial Accident Board. The idea of devoting a session to these correlated subjects exclusively is a good one and worthy of emulation by other associations.

The papers at the other sessions were also of great interest, and while discussions were necessarily short, due to the length of the program and the limited time available, this convention, which is the second held as a section of the National Electric Light Association, will undoubtedly result in much benefit to the members of the Association.

A complete report of the various sessions will be found on other pages of this issue.

THE SMALL DEALER'S INVENTORY.

A merchant who fails to keep himself accurately informed as to his assets and resources could hardly be classed among good business men. Information of this kind is especially essential in the case of the small dealer in electrical supplies. As a rule, his capital is small and his credit limited, and a constant and vigilant husbanding of his resources is the price of success. Failure to keep always before him the bearings of his affairs carefully charted is liable to result in the wrecking of his business in some unexpected crisis. A reliable inventory of his stock of merchandise is usually one of the necessary parts of this chart. This appears altogether obvious, but there is abundant evidence that the matter is one that needs to be called to the small dealer's attention.

It would be interesting to know how the practice of taking an inventory but once a year, among dealers who appreciate the value of the inventory, came about. It will be noted that in the article on the subject which appears in this issue, Mr. Richard E. Smith suggests that the small electrical merchant take an inventory twice each year. With the sort of accounting systems that some merchants employ, so frequent an inventory is probably not very necessary, but it is unquestionably true that in the case of many dealers the taking of one every six months would be a wise procedure.

Mr. Smith's suggestions as to how to go about taking an inventory, and how to account for office fixtures and the like, certainly seem very practical and to the point. Another thing that strikes one as particularly interesting is his remarks relative to the dealer's taking his employees into his confidence as to the condition of his business. It is unfortunate that the nature of the article is such that this subject had to be dismissed with a word. This is a subject on which a great deal could be said; for, after all, the good will of the employee and a desire on his part to see the business succeed and grow is a matter of far greater moment to the electrical dealer—and to the electrical contractor, too—than is any question of inventory, or cost-keeping, or of almost any one thing else. The small business man, coming as he usually does into frequent personal association with all of his employees and assistants, has an opportunity here which his larger brother misses. He can turn frankness and a disposition to be sympathetic into contentment, and money.

THE INTERESTS OF THE BELL SYSTEM AND THE PUBLIC.

The American Telephone and Telegraph Company, over the signature of Mr. Theodore N. Vail, president, has recently devoted considerable space in the leading daily papers to an exposition of the mutual relations and interests of the Bell system and the public. This is in line with the policy which has been gaining in favor upon the part of large corporations of stating frankly to the public which the corporations serve the fundamentals of its policy and the economic and commercial reasons therefor. Mr. Vail states that following its own best judgment, supplemented by the best obtainable advice, the company has endeavored to do what would best serve the public interest. Wherever possible the plans have been disclosed to the public in advance, and what has been done in carrying them out has been along ordinary business lines, with the implied and generally with the expressed approval, authorization or consent of the municipal and state authorities directly interested. The effort has been not only to obey the law, but to avoid everything which might have the appearance of an attempt at evasion. Mr. Vail believes that if each of the exchanges under the Bell system were made an independent unit, and if each connecting line were put under a separate control, the effect upon the telephone service of the country would be a condition so intolerable that the public would refuse to submit to it.

Mr. Vail believes in and was one of the first to advocate state or government control and regulation of public utilities. This control or regulation should be by permanent quasi-judicial bodies, acting after thorough investigation and governed by the equities of each case. This control or regulation, beyond requiring the greatest efficiency and economy, should not interfere with management or operation.

ELECTRICITY AND MODERN WARFARE.

An interesting sidelight upon the increasing dependence of the modern army upon electricity is afforded by an article in the current issue of *McClure's Magazine* by Frederick Palmer upon "The Most Up-to-Date Business—War." It is not generally realized outside of military circles what an entire change has come about in warfare since the opening of the great conflict between Russia and Japan nearly a decade since, but the truth is that the romantic side of war has been almost entirely eliminated by science. Conservation of the individual fighting unit has taken the place of spectacular charges across exposed areas; the shovel has become as important as the rifle; and the enemy with a pair of wire cutters in his pocket is regarded as a more deadly foe than the spy. Thanks to electricity the modern general manages a war without even being near a battle. Telephone connections with every battery, regiment and outpost keep the commander-in-chief in instant touch with his entire army, even though he may be 15 miles from a firing line 150 miles long.

The old days of the mounted dispatch bearer, riding gallantly from division to division under heavy fire, are gone from the modern army, and through telephonic connections between elevated observation points and concealed guns, the whole method of artillery firing has been revolutionized. The searchlight, portable wireless telegraph outfit, electric ignition of high-powered explosives, the aeroplane, electrically charged wire entanglement and the field telegraph have completely changed conditions of warfare, adding to its destructive resources in a way which demands the utmost care in the exposure of men and equipment. Throughout every branch of military service, from the defense of fortifications by motor-operated gun-training and ammunition-hoisting machinery to the intensive work of advanced trenches, electricity plays a part second only in importance to rations, projectiles and powder, and every advance in the military art tends to be more comprehensive because of this instantaneous and flexible agent of auxiliary service.

A NEGLECTED OPPORTUNITY.

In view of the fact that most of even the small towns and villages have their fire departments, and of the importance of getting the fire-fighting equipment to the location of a fire as quickly as possible after its discovery, it is surprising that there are so many small towns that lack adequate and reliable means of giving alarms of fire. Some of the makeshifts for fire-alarm systems found in such places are unique for their crudeness, and very often, too, they are equally so for their lack of effectiveness in fulfilling the purpose for which they were designed. A town of several thousand inhabitants is recalled in which the fire-alarm apparatus consisted of massive rings of steel, said to be locomotive tires, hung up at various street corners throughout the place. Anybody wishing to give an alarm was supposed to pound on this ring with a sledge hammer until the fire engines arrived.

The principal reason for the use of equipment like this doubtless is, in most cases, that nobody who has a technical and practical familiarity with good fire-alarm systems has undertaken to discourage it; or, perhaps, that the man who has undertaken the matter was a salesman of fire-alarm apparatus, and so his arguments were looked upon as being inspired mainly by the desire to make a sale.

Here is an opportunity for the local electrical contractor. If he is the proper sort of man, his opinions will have an effectiveness that no outsider's could possibly have. It would seem to be a chance for him to do his town a good turn, and at the same time get some business for himself.

Another place where a more general use of standard fire-alarm systems is needed is in the large industrial plants. Here again the contractor has an opportunity to do some much needed missionary work.

Colorado Meeting of the American Electrochemical Society.

The fall meeting of the American Electrochemical Society will be held on September 9, 10 and 11 at Denver, Colo., and adjacent territory. A special train has been arranged to carry the Eastern delegates, and will leave New York City by the New York Central Railroad on Saturday, September 6, at 10:30 a. m. It will leave Chicago on Sunday at 9:45 a. m., and arrive at Denver on Monday, September 8 at 1:15 p. m. Returning, the train will leave Colorado Springs on Saturday, September 13, at 10:30 p. m., arriving at Chicago on Monday at 9:15 a. m., and at New York at 9:11 a. m. on Tuesday, September 16. Pullman reservations should be arranged with the chairman of the Transportation Committee, J. M. Muir, 239 West Thirty-ninth Street, New York City.

Headquarters in Denver will be at the Shirley Hotel, where the first session will be held on Tuesday morning. Tuesday afternoon will be devoted to visits to the mill of Sutton, Steele & Steele Company, the Western Chemical Manufacturing Company and the Henry E. Wood Ore Testing Company. In the evening there will be a smoker at the University Club. A session on Wednesday morning will be held at the University of Colorado, at Boulder, after which lunch will be served by the University. In the afternoon a visit will be made to the power station of the Central Colorado Power Company.

On Thursday morning visits will be made to the United States mint in Denver and the plants of the American Zinc Ore Separating Company, the American Smelting & Refining Company and the Screenless Sizer Company. In the afternoon a session will be held at the School of Mines, at Golden, after which there will be a picnic dinner upon Lookout Mountain, arranged by the Colorado Scientific Society.

On Friday there will be a trip to Pike's Peak, returning to Colorado Springs. On Saturday an excursion will be taken to Cripple Creek.

Among the papers to be presented at the convention are the following: "Flow of Heat Through Furnace Walls: The Shape Factor," by Irving Langmuir, E. Q. Adams and G. S. Meikle; "Simultaneous Determination of Copper and Lead, With the Rotating Anode," by Arthur J. White; "Rapid Refining of Copper With a Rotating Cathode," by C. W. Bennett and C. O. Brown; "The Heat Resistivity of Carbon and Graphite," by Joseph W. Richards; "Effect of Light on Decomposition Voltage," by Alan Leighton; "The Art of Electric Zinc Smelting," by Woolsey McA. Johnson; "Possible Applications of the Electric Furnace to Western Metallurgy," by Dorsey A. Lyon and Robert M. Keeney; "The Transformation of Radiant Into Chemical Energy," by S. C. Lind; "Electric Smelting of Chromoum, Tungsten, Molybdenum and Vanadium Ores," by Robert M. Keeney; "The Carnotite Industry," by Siegfried Fischer; "Some Aspects of Heat Flow," by Edwin F. Northrup; "The Electrolysis of Cyanide Solutions," by Edward F. Kern.

Prizes for Jovians in Membership Campaign of the Society for Electrical Development.

Through literature mailed from the headquarters of the Jovian Order at St. Louis, it is pretty generally known in the electrical field that 12,000 Jovians in the United States and Canada are engaged in a great co-operative campaign to increase the membership of The Society for Electrical Development.

This commendable effort is being made under authority of the Jovian Congress which met July 26, 1913, at Niagara Falls, N. Y., and adopted resolutions endorsing the society and its objects. The campaign is now in full swing and gratifying progress is daily reported to Ell C. Bennett, Mercury, at headquarters in St. Louis.

As an incentive to Jovians who are lending their assistance to this membership campaign, the Board of Directors of The Society for Electrical Development has authorized the payment of the following cash prizes for members secured between August 15 and September 30, 1913:

$500 to the Jovian League securing the largest number of members.

$250 to the individual Jovian securing the largest number of members.

$150 to the individual Jovian securing the second largest number of members.

$100 to the individual Jovian securing the third largest number of members.

The co-operation of the Jovian Order is undoubtedly the most valuable assistance the society could receive in its efforts to complete as quickly as possible the $200,000 fund it is necessary to have pledged before its active work can begin. The subscriptions already received bring the total pledged close to $140,000.

Electric Vehicles Make Good Showing in Parade.

About 300 automobiles of all types took part in the parade held in Chicago, August 23, in connection with the Perry Centennial Celebration held during the week.

Although the gasoline pleasure cars exceeded electrics in numbers, it was agreed that the decorations of the latter surpassed those of the gas cars. The number of commercial electric vehicles exceeded the gasoline trucks by about 25.

Official announcement of the prize winners has not yet been made by the judges but the following results have been tentatively announced:

Best decorated electric pleasure vehicle, first prize, Detroit Electric; second, Chicago Electric.

Best decorated trucks—Commonwealth Edison Company; second, Firestone Tire and Rubber Company.

Trophy for largest number of entries by any one merchant—Won by American Express Company, 45 trucks.

Trophy for dealer with largest number of electric cars—Won by Detroit Electric.

Trophy for largest number of trucks—Won by Baker Electric.

Southwestern Section, N. E. L. A., Elect Officers.

T. W. Peters, of Columbus, Ga., was elected president of the Southeastern Section of the National Electric Light Association at Macon, Ga., on August 16. In addition to Mr. Peters the following officers were elected: first vice-president, C. D. Flanigan, Athens; second vice-president, J. E. Brigham, Tampa, Fla.; Executive Committee, E. S. Roberts, Savannah; M. W. Obbrett, Birmingham, Ala.; W. D. Lindsley, Durham, N. C.; S. K. Diston, Columbia, S. C.; H. C. Adams, Jacksonville, Fla.; chairman Finance Committee, W. L. Southwell, Macon, Ga.

Electric Club of Chicago Holds Successful Picnic.

Several hundred members of the Electric Club of Chicago, with their families, enjoyed an old-fashioned picnic at Northfield Inn, Shermerville, Ill., on Thursday, August 21. A series of very interesting athletic events and a baseball game, together with tango dancing, were carried out very successfully, many handsome prizes being awarded to the winners. Homer E. Niesz and his sister-in-law, Mrs. Blanche Butler, especially distinguished themselves by capturing first prize for dancing a most beautiful tango.

Examination for Dynamo Tender.

The United States Civil Service Commission announces an open competitive examination on September 17 for dynamo tender, to fill a vacancy in the Immigration Service at Ellis Island, N. Y., at a salary of $900 a year, and other vacancies as they may occur. Competitors will be examined at the usual places upon letter writing and practical questions relating to the principles of construction and operation of dynamos. Credit will also be given for training and experience. Applicants must be not less than 20 years of age and should file their applications on Form 1,800.

H. C. Sterling.

H. C. Sterling, who was elected president of the Michigan Section of the National Electric Light Association, at the annual convention held at Ottawa Beach, last week, is a native of Illinois. He removed with his parents to the then territory of North Dakota in 1880, at the age of fourteen years, locating in Huron. He received a common school education, and at the age of 20 entered the "school of hard knocks" in the electrical business which, at that time, was in its infancy. Mr. Sterling has worked his way up, through all branches of the industry, having served as wireman, trimmer, electrician, fireman, superintendent and manager. Together with his older brother he built and operated The Citizens' Electric Light plant at Helena, Montana, in 1888. In 1892 this plant was sold to a competing company and in 1893 he entered the employ of the electrical department of the World's Columbian Exposition in Chicago, being employed as foreman of construction in arc light and power work, having had active charge of this work in several of the large exposition buildings.

In 1894 Mr. Sterling again returned to Helena and became Superintendent of the Helena Rapid Transit Company operating an electric railway in that city. Upon the consolidation of this railway with that owned by the Helena Power and Light Company he served as manager of the Electric Light Department for about one year. He then moved to Dakota where he owned and operated the Huron Electric Company for a period of two years, when drought and hard times caused him to dispose of this property. He went from Huron to St. Paul, Minn., where he engaged for about two years in constructing electric light plants in various towns in Minnesota, South Dakota and Wisconsin.

About this time the theory of municipal ownership appealed to Mr. Sterling and as he puts it, took his eight years to thoroughly explore and explode the theory, arriving at the conclusion that municipal ownership, in the long run, under any and all conditions is impossible.

In April, 1911, he accepted the position which he now holds as manager of the Constantine Hydraulic Company, of Three Rivers, who own and operate a hydraulic plant at Constantine, Mich., and furnish service in Constantine, White Pigeon, Cassopolis, Vandalia, Jones and Three Rivers. Mr. Sterling has also recently been appointed manager of the Three Rivers Gas Company with office and plant in Three Rivers. He is active in Association work, taking a deep interest in all matters pertaining to the success of his chosen profession.

H. C. Sterling,
Newly Elected President of the Michigan Section, N. E. L. A.

Conference of Representative Electrical Men at Association Island, September 3 to 6.

Under the auspices of the Association Island Corporation, there will be a conference of the presidents of the electrical associations, societies and clubs of the United States, with representatives of the leading electrical manufacturers, central-station men, electrical supply jobbers, contractors and the technical press, at Association Island, Henderson Harbor, September 3 to 6.

It is expected that the exceptional opportunity available at Association Island for an informal exchange of views and the cultivation of acquaintances will result in very materially accelerating the development of a spirit of co-operation throughout the entire electrical industry. There has also been prepared an excellent program of addresses by prominent men at meetings which will be held on September 4, 5 and 6. J. B. McCall, president of the National Electric Light Association, will act as chairman of the conference.

The following program has been outlined.

"Government in Relation to Business," Wm. D. McHugh, Omaha, Neb.; Thursday afternoon, September 4.

"Distribution of Electric Energy—Present and Future," Samuel Insull, president Commonwealth Edison Company, Chicago, Ill.; Thursday afternoon, September 4.

"Future Technical Development in the Electrical Business," Dr. Charles P. Steinmetz, General Electric Company, Schenectady, N. Y.; Thursday evening, September 4.

"State Commission Control," John H. Roemer, chairman Public Service Commission, Second District of New York; Thursday evening, September 4.

"Society for Electrical Development," Henry L. Doherty, president Henry L. Doherty Company, New York; Friday afternoon, September 5.

"Principles of Re-Sale Control," F. C. Fish, Boston, Mass; Friday afternoon, September 5.

"Financial Outlook," Frank Vanderlip, president National City Bank, New York, N. Y.; Friday evening, September 5.

"Favorable Conditions for Labor," Dr. Thomas Darlington, secretary Welfare Committee, Iron-Steel Institute; Friday evening, September 5.

On Friday evening, September 5, and Saturday morning, September 6, presidential addresses will be made by J. B. McCall, president National Electric Light Association; A. W. Berresford, vice-president, representing C. O. Mailloux, president American Institute of Electrical Engineers; George H. Harries, president American Electric Railway Association; Preston S. Millar, president Illuminating Engineering Society; S. O. Richardson, Jr., president Electrical Manufacturers' Club; Franklyn Overbagh, secretary National Electrical Supply Jobbers' Association; Ernest McCleary, representing Ernest Freeman, president National Electrical Contractors' Association; F. E. Watts, Reigning Jupiter of the Jovian Order.

Pennsylvania Coal.

The combined production of anthracite and bituminous coal in Pennsylvania amounted in 1912 to 246,227,086 short tons, valued at $346,993,123, against 235,218,230 tons, valued at $321,537,250, in 1911.

Plan Kuhn Reorganization.

It is understood that prominent financiers in this country and abroad are effecting plans for the complete reorganization of the American Water Works & Guarantee Company, which entered into a voluntary receivership following the closing of the First-Second National Bank of Pittsburg and the subsequent suspension of all the J. S. & W. S. Kuhn interests. The present movement, it was said by an official of the Kuhn firm, will result in the lifting of the receivership of the American Water Works & Guarantee Company by September 1.

"The report that serious difficulties had arisen between the Pittsburg interests and a large majority of the holders of stock, of which approximately $8,000,000 is held abroad, was," says the New York *Journal of Commerce*, "positively denied by officials. On the contrary, L. L. McClelland and William G. Audenreid, Jr., both connected with the Pittsburg office, have been engaged during the past week in effecting the organization of a protective committee, representing all interests involved by the receivership, their efforts culminating on Thursday last in a meeting in the city between Mr. McClelland and H. J. de Lanoy-Meyer, a prominent banker and broker of Amsterdam, Holland, who represents several millions of the Kuhn stocks."

Examination for Electrometallurgist.

The United States Civil Service Commission has announced an open competitive examination for electrometallurgist for service in the Bureau of Mines at a salary of $1,800 to $3,000 a year. The duties of this position will be to conduct investigations and inquiries into metallurgical problems, the investigation of ores with reference to constitution and treatment, with special reference to feasibility of treatment by electrometallurgical processes.

Competitors will not be assembled for examination, but will be rated on the basis of general education, scientific training, practical experience and publications or theses. Applicants should secure Form 304 from the United States Civil Service Commission, Washington, D. C.

New Wireless Station.

One of the largest wireless stations in the world will be established at the United States Naval training station at Lake Bluff, Ill. Captain E. R. Clark, commandant, announced that $100,000 will be expended in its construction. The station will be able to communicate directly with San Francisco and New York.

HOW THE SOCIETY FOR ELECTRICAL DEVELOPMENT WILL HELP THE INDIVIDUAL.

By Frank E. Watts.

The first question which an electrical man will propound when approached in reference to the Society for Electrical Development, is likely to be: "What will the Society do for me?"

He wants to be convinced that it is going to be a benefit to him individually before he gives either his money or his efforts in furthering its plans.

To attempt to briefly answer the above question is the purpose of this article.

In the first place, a man must understand that only as an industry or business in which he is engaged grows can he grow. He will prosper in the same measure as the company with which he is connected prospers, and as its business is developed and enlarged. A greater volume of business for his company means greater opportunity for advancement and promotion to him.

No man is likely to look into the future with much gratification when he is connected with a business which is on the decline; but he is much happier if he sees the possibility for growth and knows that with that growth will come the opportunity of benefiting himself.

Concisely stated for our purpose here, the object of the Society is "to create a greater demand for the use of electricity," and thereby create a larger market for electrical apparatus and appliances of all kinds.

The plans formulated by the Society for doing this have been pronounced feasible and sound by many men competent to judge of their effectiveness.

Now, if these plans are carried out, let us trace the results and benefits to the individuals connected with the various branches of the electrical industry affected. A greater demand for electricity means that more houses will be wired, more apparatus for generating electricity will be installed, and more appliances for consuming electricity will be purchased.

This, in turn, means that the contractor or individual working for the contractor will have more work to do; therefore the contractor will purchase more electrical supplies and the jobber or jobber's salesman will sell him more material; the jobber will necessarily purchase a greater quantity of electrical goods from the manufacturer through his representatives; in the final analysis the central station will sell more current, and every man in its employ should benefit thereby.

Every branch of the industry is affected by an increased demand for electricity, and this means greater opportunity for every man in the business, whether he be in the factory, in the office, in construction work, a salesman for jobber or manufacturer or a member of the company.

The more rapidly the electrical business develops, the larger the opportunity of the individual; and to develop the business more rapidly is the purpose of the Society for Electrical Development, which for this reason deserves the support of every man who will be affected by such development and growth.

Exposition at Japanese Capital.

While the Tokyo Exposition to be held March 20 to July 31, 1914, is primarily for the Empire of Japan and its colonies, exhibits from foreign countries will be accepted as specimens. While the space set aside for foreign exhibitors is not large, it is believed by the exposition managers that they will be able to accommodate all those who wish to participate. The date on which foreign exhibitors may apply for space expires on October 30, 1913. The Japanese exhibits will be classified into 14 departments.

A booklet containing the exposition rules and regulations, classification of exhibits, etc., will be loaned on application to the Bureau of Foreign and Domestic Commerce, Washington, D. C.

London Street Lighting.

In the City of London area there are still in service 329 of the original open-type arc lamps, charged for at $130 per lamp per annum. There are 94 Oliver and Excello flame arcs also—the 73 Olivers being charged at $88 per lamp per annum, and 45 metal-filament lamps. The electric arc lamps experimented with in some thoroughfares are of 3,000 candlepower, hung 27.6 feet high and 90 feet apart. Where metal lamps are between, the arc lamps are 200 feet apart; some 4,000-candlepower lamps are 25.6 feet above the roadway and 175 feet apart. For narrow courts and lanes 75-candlepower metal-filament lamps are used on brackets 12 feet 6 inches above the roadway.

London Clocks.

English cities in general, and London in particular, are sadly lacking in the provision of effective time service. The need for something better is causing a good deal of discussion just now. The city engineer reports that the clocks in the city of London fixed above the public ways by private parties number 106 and of these only 42, and none of the 29 churches, are synchronized.

Electricity in a Modern Shoe Factory.

The recently completed shoe factory of the George E. Keith Company at South Boston, Mass., is completely equipped with the electric drive, the service being furnished by a gas-engine plant located in an adjacent power house. The factory was designed for a daily output of 4,500 pairs of women's shoes; but at present machinery is installed for the manufacture of 2,500 pairs per day. The many advantages of the electric drive, and the great economy and desirability of electrically heated irons in the manufacture of shoes were appreciated by the company in the equipment of the plant, resulting in an installation of 50 motors varying in size from 0.5 to 35 horsepower, aggregating approximately 235 horsepower, and 25 electrically heated treeing machines.

The building is of the slow-burning mill-construction type, five stories in height above a basement, with brick walls and limestone trimmings. The floors are of wood supported on beams and girders. Its plan is in the form of an H, the front and rear portion being 45 feet wide, and 203 and 190 feet long respectively, the former abutting the street. The two sections of the building are 50 feet apart and separated by a fire wall.

The rooms are so arranged that the regular sequence of manufacture is followed with the least expenditure of labor. The cutting rooms are located on the fifth floor; the sitching rooms on the fourth; the making rooms on the third; the trimming, heeling and finishing on the second; treeing, dressing and packing, and office on the first floor, and the sole and last assorting rooms in the basement.

The power house is located at one end of the building, between the front and rear sections, at the basement level about five feet below the surface of the ground, and is lighted and ventilated at the roof by transom skylights. Entrance to the plant is made through the rear basement and a boiler room occupying an extension of the former. The boiler equipment includes a 150-horsepower return tubular unit used for supplying steam for the heating system and to certain machines.

The power plant, consisting of an engine and generator room, is about 44 feet long, 23 feet wide and 15 feet high. The engine equipment is comprised of three 140-horsepower, 13 by 14-inch three-cylinder vertical Westinghouse gas engines direct-connected to 75-kilowatt, 220-volt, three-wire interpole generators of the same make running at 265 revolutions per minute. The normal rating of the plant is 225 kilowatts. The engines burn gas supplied from the Boston Consolidated Gas Company's service connection through a 6-inch pipe leading to two 500-light meters with connections so arranged that the gas can flow through both meters or one can be used as a spare. The engine and dynamos rest on a reinforced concrete foundation, 28 feet long, 15 feet wide and 3.5 feet deep, supported on piles. The engines are supplied through 2.5-inch branches from a 6-inch main leading from the meters. The engines exhaust through 6-inch pipes into an 18-inch manifold 22 feet in length, discharging into a 10-inch

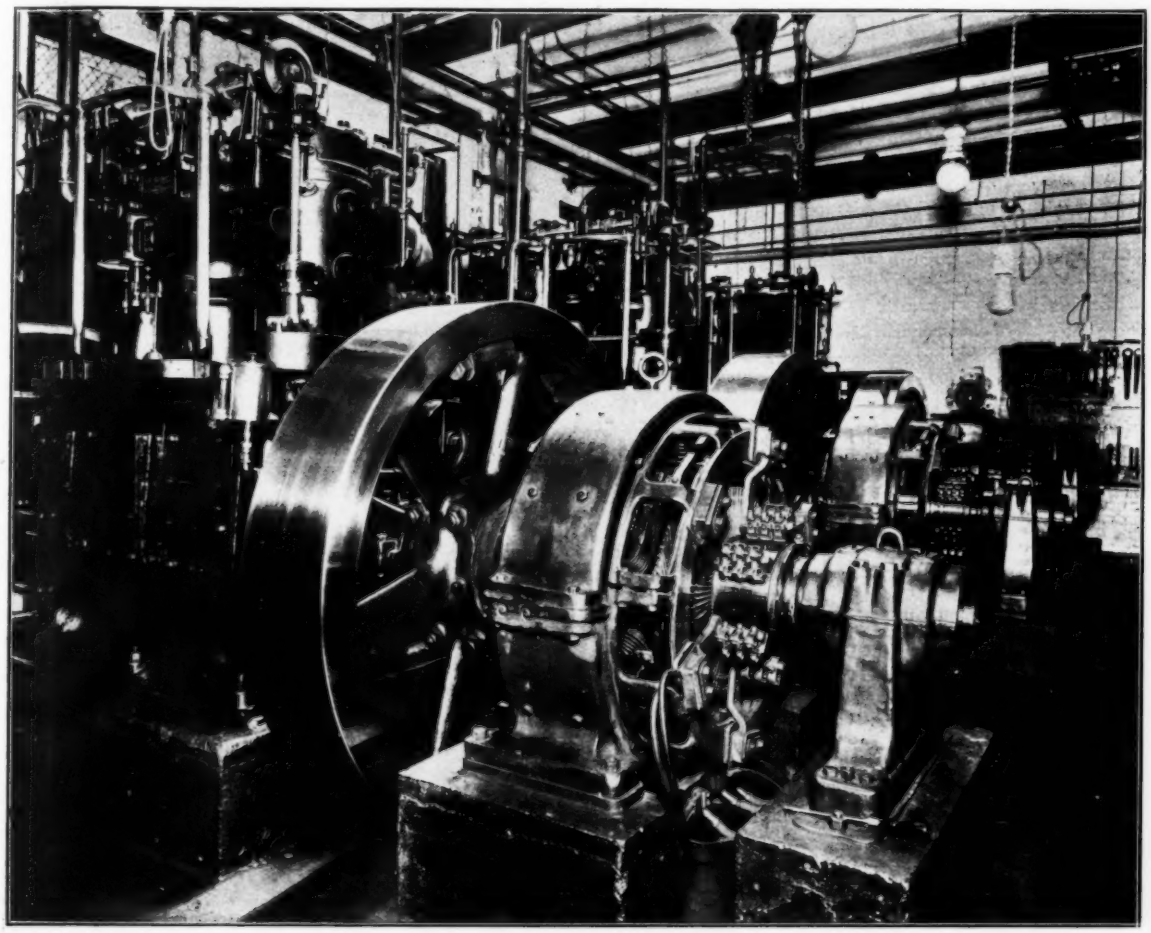

Fig. 1.—General View of Gas Power Plant at Keith Shoe Factory.

pipe leading to a riser extending 6 feet above the roof. The manifold is provided with tees and renewable covers at each discharge inlet.

Cooling water is supplied from the city mains through a two-inch pipe suspended from the ceiling with 1.25-inch branches to each engine, and a connection is made to the water jacket of air compressor. The heated jacket water is carried to the sewer by a pipe connecting with a header provided with a relief valve. A sewer connection is fitted to the header beyond the point where the drips enter the line.

Compressed air for starting the engines is furnished by a 4 by 6-inch duplex water-cooled air compressor, belt driven by a three-horsepower, 220-volt, direct-current Crocker-Wheeler motor. Auxiliary power for operating the compressor is obtained from a four-horsepower Nash gas engine located so that it can be belted to the machine. Ample air storage capacity is provided by the use of four tanks holding approximately eight cubic feet each. One-and-a-quarter-inch pipe is used in the air piping system with one-inch branches to each engine.

There are three independent sources of electrical supply for the engine ignition: a Wood motor-generator set consisting of a two-horsepower, 220-volt direct-current motor direct-connected to a one-kilowatt, 15-25-volt direct-current generator running at 1,800 revolutions per minute; a primary battery of six dry cells, and three cells of two-plate, type "ET" Edison Storage Battery Company's units for each engine. The batteries are installed in a cabinet, fitted with four doors and fastened to a side wall near the switchboard about four feet above the floor.

Access to the upper parts of the engines is facilitated by means of iron ladders and an elevated platform consisting of cast-iron plates supported on I-beams built into the wall of the power house and carried on pipe columns. The manifold is suspended from the I-beams.

The switchboard is of slate 7.5 feet high and 14 feet long, and is placed 8 feet from one end of the engine room. There are seven panels; one ignition, one balancer, one lighting, one power, and three generator panels. The ignition panel is equipped with three four-pole, double-throw switches, three two-pole, double-throw switches, and two single-pole switches. A four and a two-pole switch is placed in the ignition circuits of each machine, and the connections are so arranged that the storage batteries will be automatically thrown into service if the motor-generator fails. The single-pole switches control the circuits for the engine-room lighting, the operation of the air compressor motor and the ignition motor-generator set.

There are two field regulators, two motor-starters, two double-pole, single-throw switches, and two single-pole single-throw switches attached to the balancer panel. The equipment of the lighting panel consists of a three-wire Duncan watt-hour meter, and five three-pole, single-throw switches, including a spare and main switch. The three remaining switches control the lighting circuits for the front and rear portions of the building and the treeing irons. The power panel is equipped with a two-wire Duncan watt-hour meter; circuit-breakers and double-pole single-throw switches controlling an exhauster and elevator line, and circuits to the front and rear portions of the factory. The generator panels are furnished with the usual ammeters, circuit-breakers and switches. The circuit-breakers are equipped with reverse-current relays to prevent trouble caused by an engine working badly when the generators are connected in parallel.

There are two 120-ampere Westinghouse interpole rotary balancers, running at 1,500 revolutions per minute, installed in the lighting system. One machine is held as a spare. A Holtzer-Cabot motor-generator set consisting of a five-horsepower, 220-volt, direct-current motor running at 1,800 revolutions per minute driving a 110-volt, three-kilowatt alternating-current generator is used for supplying current for the special machine lamps throughout the factory. A smaller machine of the same make driven by a 0.25-horsepower, 110-volt, direct-current motor rotating at 1,750 revolutions per minute generates alternating current at 10 volts for ringing a system of call, and stopping and starting bells.

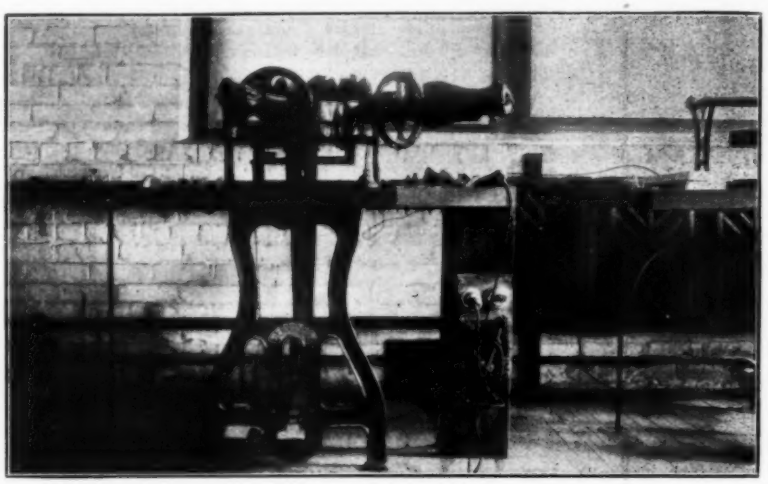

Fig. 2.—Treeing Machine.

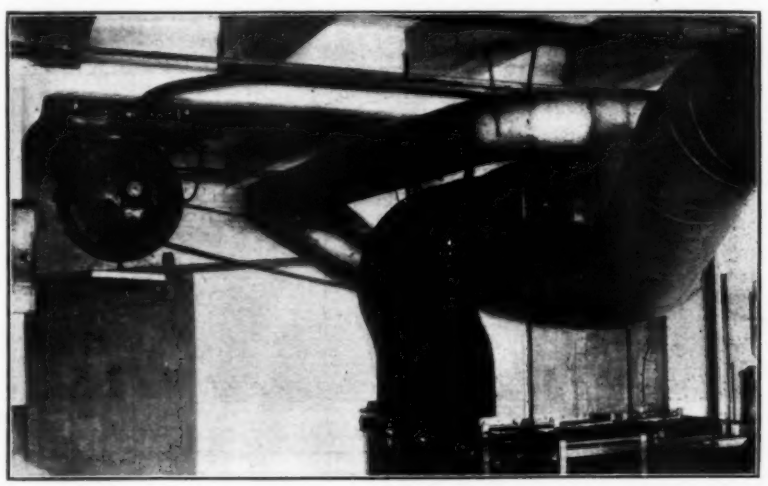

Fig. 3.—35-Horsepower Motor Driving Fan.

The equipment of the engine room is compactly arranged; the equalizers and the two larger motor generators are placed in tiers along the side wall of the power house adjacent to the battery cabinet. The lower equalizer is attached to the floor and the upper one rests on I-beams supported by pipe standards. The motor-generators are similarly arranged.

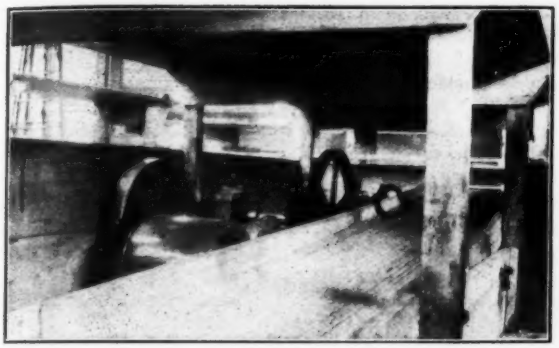

Fig. 4.—Motor Driving Conveyor.

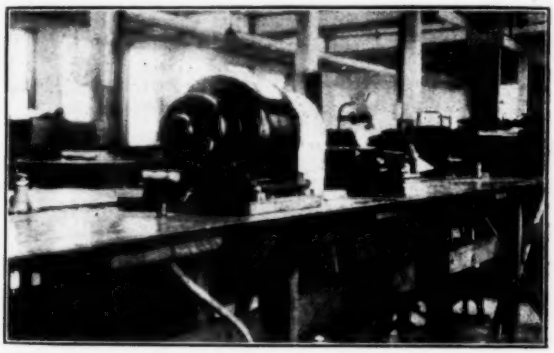

Fig. 5.—Typical Motor Drive on Bench.

The 0.25 horsepower motor-generator set is placed on top of the battery cabinet, and the starting rheostat and switch are attached to an end of the cabinet within easy reach of the operator. A three-foot square slate switchboard, secured to the wall near the cabinet, is equipped with a starting rheostat and switches for the three-kilowatt motor-generator set, and near at hand on the wall is located a smaller panel controlling the one-kilowatt set. Above the latter panel are placed a single-throw double-pole switch and fuses connecting with the circuit leading to the exhausters, permitting the fans to be controlled from the power house. The engine room is lighted by twelve 40-watt tungsten lamps.

Three rubber-covered, lead-encased, stranded 500,000-circular-mil cables convey the generator circuits to the switchboard in galvanized-iron conduit laid under the floor of the engine room. Three No. 00 similarly protected wires connect the equalizers with the switchboard. The ignition circuits consist of No. 12 wires, and the air-compressor motor and the engine-room lighting circuits are made up of No. 10 wires.

The lighting service consists of three-wire distribution at 220 volts between the outside wires, and the power supply is of the 220-volt, two-wire system. The feeders and risers are laid in iron conduit. Two lighting risers were run from the switchboard to points in the basement at about the center of the building, one on either side of the fire wall, thence up through all the floors with distribution centers on each. The distribution centers consist of iron junction boxes attached to the columns. Similarly, power risers are installed on both sides of the factory, except the fifth floor is supplied from junction boxes located on the fourth. A power feeder is run to a point near one of the freight elevators where a junction box is placed, and the conduit is continued to the second elevator. A feeder supplying the motor driving the exhausters is tapped near the switchboard from the circuit furnishing current for the elevators, and is equipped with the previously mentioned switch located in the power house.

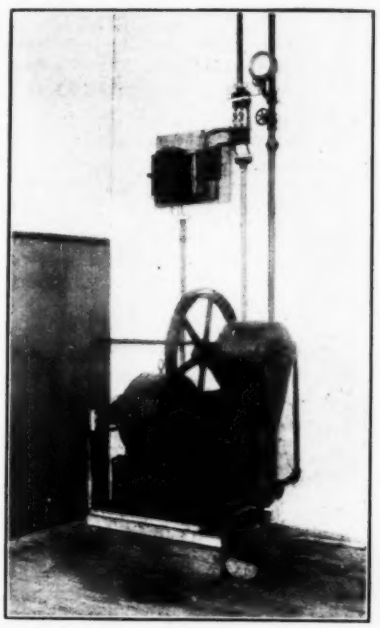

Fig. 6.—Motor-Driven Air Pump.

The general illumination consists of 40-watt tungsten lamps suspended from the ceiling. The lighting of the larger machines consist of 25-watt tungstens attached to adjustable cords hung from above. The smaller machines in the skiving and stitching rooms, including the match-markers, sewing, skiving, vamping, and buttonhole machines, are fitted with the Permel fixtures equipped with four-volt, six-candlepower carbon lamps so arranged that the light falls directly on the work.

The lighting mains at the ceilings of the factory on either side of the fire wall are run from the centers of distribution in conduit to a point where three-wire submains are run on cleats attached to a back board extending the length of the building. The lighting feeders on the fifth floor are extended through the centers of the rooms, and are fastened to the roof; where the span was too great for cleat work on account of a number of saw-tooth skylights, the wires were supported by turn-buckle suspension.

The feeders for the machine lights in the stitching room are run on the ceiling of the room below, and rise through the floor in conduit to the underside of

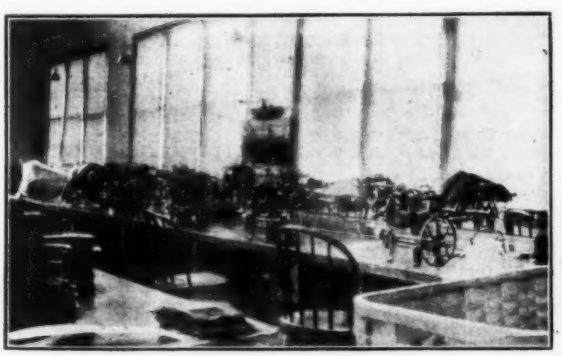

Fig. 7.—Two-Horsepower Motors Driving Skiving Machines.

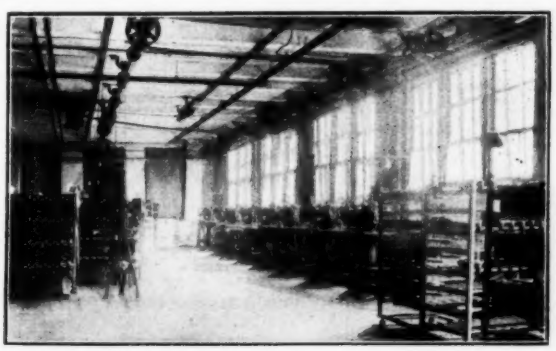

Fig. 8.—Motor Driving Stitching Machines.

George E. Keith Shoe Company.

The following is a list of the motors installed with their respective drives. The supply source is 220 volts, direct current, except in those cases marked with an asterisk, in which the motors are connected to the 110-volt lighting circuits.

No.	Horse-power.	Speed, R. P. M.	Application.
1	3	1,175	Belted to a table driving one punch, four embossing, two perforating and two folding machines.
2	2	1,175	Belted to tables, each driving ten skiving machines.
2	1.5	1,800	Belted to tables, one driving five match markers, and the other seven match markers.
3	0.5*	1,650	Each belted to a shaft driving a grindstone and an emery wheel.
1	2	700	Geared to a 3 by 10-inch duplex air pump.
1	3	1,650	Geared to a shaft driving two 14-inch canvas conveyors through chain and sprocket and counter shaft.
7	2	1,175	Belted to tables, one driving six buttonhole, two sewing and two eyeletting machines; one driving eight buttonhole machines; and five driving 20, 19, 16, 15, and 5 sewing machines respectively.
2	1.5	1,800	Belted to tables, one driving three lining markers, and the other driving nine sewing machines.
3	2	1,175	Belted to tables, one driving three buttonhole and ten sewing machines, one driving 16 vamping machines, and one driving 14 vamping machines.
1	1.5	1,800	Belted to a shaft driving one lathe and an emery wheel.
1	5	1,850	Belted to a shaft driving three rough rounders; two loose nailing, two shank reducing, two channel-opening machines.
1	3	1,750	Belted to a shaft driving three sole laying machines.
1	3	1,750	Belted to a shaft driving two welt beaters, three inner-sole trimmers and one emery wheel.
1	5	1,850	Belted to a shaft driving three automatic sole-levelling machines, one heel-seat trimmer, and one Goodyear welt indenting and burnishing machine.
1	3	1,750	Belted to a shaft driving three stitch-separating machines.
1	5	1,850	Belted to a shaft driving two shank rubbers; one bobbin winder; two cementers; eight Goodyear stitching, two channel-laying, and one channel-cementing machines.
1	15	800	Belted to shafting driving one grinder, six pulling-over machines, two upper-trimming, two tack-pulling, and two upper-stapling machines.
1	5	1,850	Belted to a shaft driving six welting machines and one welt-grooving and bevelling machine.
1	10	1,260	Belted to a shaft driving three automatic loading and attaching, and three nailing machines.
1	7.5	1,425	Belted to a shaft driving three Universal slugging, and three heel shaving machines, and one emery wheel.
1	5	1,750	Belted to a shaft driving one edge trimmer, two heel breasting and three heel scouring machines.
1	7.5	1,425	Belted to a shaft driving six edge setters.
1	5	1,750	Belted to a shaft driving six edge trimmers.
1	10	1,260	Belted to a shaft driving three edge trimmers.
1	7.5	1,100	Belted to a shaft driving one expedite, two heel scouring, two heel-blacking, four bottom-scouring, and three Naumkeag scouring machines, and two bottom brushers.
2	3	1,750	Belted to shafting, one driving three expedite machines, and one driving five bottom polishers.
1	35	1,000	Belted to two 70-inch exhausters running at 500 revolutions per minute.
1	3	1,750	Belted to a shaft driving two stamping machines.
1	2	1,175	Belted to a shaft driving three buffers, one creasing and two marking machines.
2	17	650	Geared to elevators.
1	5	1,850	Belted to shafting driving one skiver, seven channelers, two rib tighteners, six channel turners, four bottom flexers, two emery wheels, one inner-sole machine, three flexible and three rounding machines.
1	3	1,750	Belted to a shaft driving two grading and two feather edge machines.
1	7.5	1,100	Belted to shafting driving one 4.5-foot Seelye stripper, one top cutter, one emery grinder, one grindstone, one Julian cementer, one 30-inch rolling machine, two outer sole moulders, two Planet rounders, two Nicholas graders, two 8-inch Summit splitters, two 7.5-inch baby splitters and two 7-foot gearless sole cutters.
1	2	1,175	Belted to shaft driving two Empire splitters, one tap-trimming machine, four Apex shanking out and three rotary feather edge machines.
1	3	1,750	Belted to a shaft driving one reamer, one last-repair machine, one inner sole trimmer and three sole tackers.

the tables, supplying various outlets in a horizontal conduit extending the length of the tables through condulet fittings. In the skiving room the horizontal conduit is placed on the top and at the rear of the tables, and a flexible cord is run from the outlets to the lights on the machines. The feeders from the three-kilowatt motor-generator set in the power house are brought in conduit to the rooms below those served with the special machine lights, and leads connect with twelve 0.125-kilowatt transformers, reducing the potential from 110 to 6 volts, supplying the small lamps.

The tree-iron heater circuits consisting of 110-volt lines are run in conduit from the switchboard to a junction box, from which branches in conduits lead along the wall back of the treeing machines. An iron junction box outlet was installed opposite each machine, and a conduit, terminating in an "A" condulet was laid on the floor to the rear of the support for the rheostat at the front edge of the treeing machines, as shown in one of the illustrations. The wires pass through the back board supporting the rheostat and the slate panel to binding posts. A double-pole snap dial switch and a keyless wall receptacle are mounted on the slate panel. Each heater consumes 1.5 amperes at 110 volts. Additional heating appliances such as flat irons, tool heaters and embossing dies furnished with heating elements are supplied from the lighting circuits.

About 70 per cent of the operations on each pair of shoes are performed by machinery using a small amount of power whose requirements are of an intermittent character, and the group drive is employed as being the most economical and the lowest in first cost. The motors in the cutting and stitching rooms are placed on the tables and belted to line shafts extending underneath from which the machines are group driven. The motors driving the larger machines are generally attached to the ceiling and belted to shafts located along the sides and ends of the building. All the line shafts are run at 400 revolutions per minute, except those in the stitching and cutting rooms which revolve at 350 revolutions per minute. The belting in no case extends across a room as the motors are placed only far enough from the shafts to permit ideal driving. The machinery is arranged in small groups thus reducing the fluctuations in speed to a minimum and obtaining a practically constant speed that allows the operation of the machinery at its highest efficiency. Another advantage obtained by the small group drive is that if an accident should happen to a motor or to a line shaft only a comparatively few machines and operators are made idle.

Fig. 3 shows a 35-horsepower motor belted to pair of 70-inch exhausters with ducts leading from the edge trimmers, heel scouring, buffing and grinding machines. The dust and shavings are forced into a Carlisle separator located outside the building, the air being separated and the solid matter discharged through a chute into a receptacle and later burned. Fig. 6 illustrates a two-horsepower shunt-wound motor geared to a duplex, 3 by 10-inch cylinder air pump connected with two metal pressure tanks located on the roof. The tanks are an auxiliary supply for the sprinkler system.

The carrier system has been installed in the cutting room, and consists of two 14-inch canvas belt conveyors running under the cutter's benches. The conveyors are about 180 feet between centers and travel at a speed of approximately 120 feet per minute, being group driven by a three-horsepower motor located on the floor under one of the benches, as shown in Fig. 4.

A typical installation of a motor on a table and belted to a group of machines is illustrated in Fig. 5. The conduit is terminated near the motor binding posts, requiring the use only of short leads. A perforated galvanized-iron cover incloses the pulley and belting above the table. Fig. 7 shows two tables each equipped with 10 skiving machines driven by a two-horsepower motor. The starting rheostats are conveniently placed on the wall in front of the tables.

Two Moore & Wyman direct-connected electric elevators, having a lifting capacity of 4,000 pounds at a rate of 65 feet per minute, are installed in the front and rear portions of the building. The elevators are operated by 17-horsepower motors running at a speed of 650 revolutions per minute.

The average monthly light and power cousumptions are about 3,300 kilowatt-hours, and 20,000 kilowatt-hours respectively. The general practice is to operate two generators, the third being held in reserve.

The cutting of the uppers and the sole stock for the women's shoes made in all of the company's factories is done at this plant, and watt-hour meters have been installed in the lighting and power circuits of the cutting and sole rooms enabling accurate account being kept of the cost of manufacture in those departments.

The system of call bells installed throughout the factory is controlled from a switchboard located in the main office, the stop bells are rung from the engine room.

Crocker-Wheeler, Westinghouse and General Electric motors are generally used. The power plant was designed by W. H. Edmonson, engineer of the Boston Consolidated Gas Company. The contractors for the electrical installations were the Barnes-Pope Electric Company, Boston, Mass.

Commercial Practice
Management, Rates, New Business

New Billing System in Louisville.

The Louisville Gas & Electric Company, of Louisville, Ky., has put into use a new system of billing, taking the place of the methods used heretofore by the various companies operating in the gas and electric fields prior to the recent merger. The bills are not mailed, as heretofore, but are distributed by hand. This is not only an economy, but is necessary because of the large size of the sheet, all charges for electricity for light and power and gas for heating and light being provided for on a single sheet. One crew takes care of the entire work of meter reading and bill distribution, the city being divided into 24 districts and the crew handling one district each working day. This enables experienced men to be kept busy all the time and obviates the necessity of a largely increased force. Additional pay stations for the payment of bills have been established, with a minimum of three in each of the 24 districts. A uniform charge of two cents for payment at these stations is made by the company. Some of the companies formerly operating charged as high as five cents for this convenience.

Denver Offered Cheaper Lighting.

The Denver Gas & Electric Light Company, has made a proposition to the city council of Denver, Colo., that in case the price contract it now has with the city on lighting rates, which

expires in 1916, is extended to 1926, the expiration of the franchise of the company, it will reduce its rates on arc and incandescent lights used by the city. The rate on these lights is now $60 a year for arc lights and $28 a year for 50-candlepower incandescent lights. In case the city will extend the present contract the company offers to furnish current for the arc lights at $55 a year for the three years remaining of the present contract, $50 a light for the next five years, and $45 for the last five period. For the 50-candlepower incandescent lights it agrees to make a $20 a year rate beginning January 1, 1913.

Effective Advertising in Boston.

The Edison Electric Illuminating Company of Boston is appealing to comfort and convenience in the home, in its summer advertising. One of the company's out-door illuminated signs calls attention to the use of electricity for both heating and keeping cool, an electric fan and an electric flat-iron being pictured to give point to the claim.

The Edison Company offers the General Electric, the Simplex and the Westinghouse flat-irons at $3.50 and the Universal at $4.00. A reading notice used in the suburban newspapers in this connection points out that it is claimed that the average housekeeper walks a distance equal to that from Boston to New York, 234 miles, in doing her ironing for the year, in going from the stove to the ironing table and back. The advertisement does not vouch for the accuracy of these figures.

Lower Rates in Omaha.

The Omaha Electric Light & Power Company has announced a reduction in rates to take effect on October 1. Heretofore the maximum net rate has been nine cents per kilowatt-hour, with a minimum of 3.5 cents for large consumers. The new schedule of rates is as follows: for the first 200 kilowatt-hours, eight cents per kilowatt-hour; for the next 400 kilowatt-hours, five cents; for the next 2,600 kilowatt-hours, three cents; over 3,200 kilowatt-hours, two cents per kilowatt-hour.

Activity in Youngstown.

The Republic Railway & Light Company, operating in a number of western Pennsylvania cities is conducting active campaigns for domestic customers with excellent results. In Youngstown, particularly, the sale of heating devices and the wiring of old houses has been greatly stimulated by these campaigns. During the past five months the power department in Youngstown has closed 81 contracts with a total connected horsepower in motors exceeding 5,500.

CENTRAL-STATION MERCHANDISING.[1]

By George R. Jones.

The question of what policy central stations should pursue in their merchandising business has lately developed into an issue of considerable importance in the industry, and central-station managers throughout the country are to-day giving this subject more thoughtful consideration than it has ever before had. Is this part of their business a legitimate one, subject to the same laws of commercial success or failure that their main business is subject to, and dependent for its growth on the same degree of careful management, or is it in the nature of a by-product, to be cultivated not because it is in itself profitable, but for ulterior reasons, involving indirect returns, and in that respect similar to such enterprises as the restaurant business as conducted by modern department stores, or the summer park which opens its gates free to those who are willing to be lured into the concessions?

One time-honored theory which we have all heard, namely, that electrical appliances while in their infancy had to be forced at a sacrifice upon an unwilling public and that this burden was rightly borne by those who profited most, I dismiss as being irrelevant now to the question. This idea may or may not have been well founded, but it must be conceded that the missionary work is done, and that this business has been nursed, so to speak, beyond the infant industry stage to a point where it gives promise of undergoing a development equal to that of any of the older established branches of the electrical industry.

Up to the present time we have seen an inconsistent and by no means uniform policy among central stations on the question of marketing appliances, but the feeling has gradually taken shape that there should be inaugurated a general and determined campaign of education on the part of the leading central stations, with the view of bringing out the preponderant opinion of the industry on this subject.

The question then is, will the appliance business thrive best, and thus in the long run yield the largest profits to the central station, under a cut-price-no-profit policy, or under the accepted laws of competitive mercantile business? In this connection it is no more than fact to state that many of the progressive central stations have adopted a policy of honest merchandising, whereby their merchandising departments profit or lose on their merits. Some central stations, moreover, have carried this laissez-faire policy to the extreme of handing over appliance business which they have themselves created to the already existing agencies, manufacturers and dealers, for completing their sales. But the average central station continues to run this department as a sort of game of hazard, matching kilowatts against dollars and cents, and never willing to take stock of its winnings or count the costs.

The little corner where irons used to be demonstrated has grown to a splendid display room, the front parlor of the central station, occupying a large floor space in a building located in the choicest business district of the city. Have the rental charges against the appliance department grown proportionately, or does the central station charge this rental to its light and power business and so relieve the appliance department of the necessity of paying for the space which it occupies?

Not very long ago the advertisements of a central station would occasionally mention such things as toasters or irons, more as an aside than as a direct appeal for the business. Now these staple articles blaze forth in unembarrassed headlines. Our light bills carry ads extolling the virtues of appliances, and attractive flyers take their message of electrical household economy along with the regular mail into many homes. Is this advertising of appliances in its various forms charged against profits of the department, or is it considered part and parcel of the general business policy of the central-station company designed to promote the use of electricity? Once the light or power solicitor, while on his regular beat, would have been taken unawares at receiving a trial order for a washing machine; but in the modern order of things electrical, there are full-fledged salesmen that do nothing else but handle this class of business. Is their time charged against the profit of their sales?

In the majority of cases, probably, these charges do not fall where they belong. If this is a fact, the first thing the central station should do is to so modify its accounting system that its sales figures tell the true story.

If there are red figures in this department, the central station should prepare to stimulate its business and focus some merchandising talent on its appliance sales. This will increase its overhead, but if handled right will more than proportionately increase its sales. Opposed to this policy of forc-

[1] A paper read before the Chicago convention of the Electrical Supply Jobbers' Association and also presented by C. J. Litscher before the Michigan Section convention at Ottawa Beach.

ing the business, rather than cutting the price, we hear on every side the objection that a central station can't increase its appliance business so long as it is up against the stone wall of high prices. The answer is that what is an obstacle to a central-station man in handling appliances is not necessarily an obstacle to the merchandising man. His obstacle is not high prices of appliances but the lack of merchandising methods and his argument is that it is the universal order of business to charge a price which will allow the jobber and the dealer or any other middleman a profit. Let the central station start with an ample margin of profit, against which it is prepared to place all legitimate overhead expense; then its problem is to increase its business, or, as the merchant says, force the relation of the turn-over to the margin of profit to such a point that the business can be made to pay.

The trouble with central-station appliance business is that their appliance stock turn-overs are not large enough, and the reason is that the sales factors which make a good turnover possible are not brought into play. Among these sales factors the most important one is the attitude of the central station. If the central station harkens to the voice of experience it must necessarily divorce the sales policy of its light and power business, which is essentially monopolistic, from its mercantile business, which is essentially competitive. Not all central stations, I think, fully appreciate this.

The right policy once determined, the question of the proper location for the store is, of course, of next importance. Then, if the arrangement of the store and the quality of the "appeal" to the eye is not what the buying public desires, it should be changed. Essential also is the character of the window display, which is the key that opens the door to business within. This lesson is an easy one to learn, for it is constantly before our eyes in other lines of trade. But even if all of the above points are studied and carried out with painstaking care the source of business is going to remain stopped until the proper merchandising methods of handling it are successfully put into operation. A good location, a well planned window display, a store with a neat and busy looking interior when backed up by correct merchandising methods, will cause a steady current of business to set in which will make the whole appliance proposition profitable where before it was non-profitable, and when the profit figures are down in black and white, we will find that a cut-rate selling price would not have answered.

It is not a question of selling this or that article at 10 per cent or 15 per cent, or any other percentage above cost. It is a question of applying the laws of business to the natural law of supply and demand. No mercantile establishment will sell goods at a fixed percentage above cost, because it is better business to sell some articles at a 10 per cent profit than others at 20 per cent. The price must be made to fit the various conditions of turnover, depreciation, fragibility, etc., which exist in every line of trade.

But aside from considerations of immediate profit, and more vital than these, is the question of ultimate profit. The ultimate profit for the central station is in the hands of the many agencies, manufacturers, jobbers, dealers and contractors, who are dependent upon the up-building of the mercantile end of our industry. The central station can ill afford not to have this army of co-operators behind the business, first profit or no first profit. To co-operate with them in this matter of prices is the quickest way to turn a limited use into a universal use. Nor is it a detriment, in my opinion, to have the central stations in this business. Without the central stations the business would assuredly not have arrived at its present healthy stage. With them in the game, the future should see not only the business which they would naturally obtain from their great resources and their many sided contact with the public, but also the vast additional business resulting from competitive conditions in the trade, which will redound to dealer, contractor, and jobber.

There are in the down town district of the City of Chicago to-day, where rental values are very high, four electric appliance stores—three in addition to the central-station store, the Electric Shop. These stores are carrying on a retail merchandising business and paying their bills out of their profits. In addition to the above there are many jobbing houses, lighting and fixture stores, and department stores, where appliances are sold at retail. Here is a good argument for central-station co-operation.

There is probably not a central station in the country but wishes well of the contractor—and would like to see him more prosperous. There is probably not a central station but wishes well of the jobber and would like to see his business increase. Certainly the central station should welcome a suggestion for bringing such a result about, if it can be shown that it is not at the expense of its light and power load. A practical way is to carry on this appliance business so that the jobber and the contractor and the small dealer can afford to handle it.

The tendency is unmistakable. The spirit of co-operation is strong in the industry. The various lunch clubs are helping to solve the problems, the Sons of Jove are making it more possible to bring this result about, the Contractor's Association and the Jobber's Association are bringing their influence to bear in its accomplishment, and lastly, the Society for Electrical Development is knitting together the various sections of the industry. It remains for the central station to take a decided stand for co-operation.

Complaint Record of the Detroit Edison Company.

Open-mindedness and fair play without exception is the attitude of the Edison Illuminating Company of Detroit in all complaints entered against the company. That this policy is the proper one to assume is indicated by the accompanying figures, presented in a paper by D. B. South before the recent convention of the Michigan Section, N. E. L. A., showing that during 1912 the total number of complaints received was 1,161, which represents less than two per cent of the total number of customers supplied by the company.

The data are as follows:

Classified as follows:		
Residence lighting	711	
Commercial lighting	314	
Power	98	
Churches, lodges, etc.	22	
Private automobile charging	14	
Public automobile charging	2	1,161
Nature or complaints:		
On bills rendered	1,088	
On base rate	49	
On noisy meters	20	
On pressure (no cause for)	4	1,161
Complaints justified by:		
Fast meters	49	
Creeping meters	32	
Error in base rate	28	
Clerical error	9	
Meters overread	54	
Meters noisy	20	
Ground on premises	14	
Short-circuit	4	
	210	
Complaints not justified	951	1,161
Meters found correct on complaint	915	
Meters found slow on complaint	99	
Meters found creeping on complaint	32	
Meters fast on complaint	49	
Meters not necessary to be tested on complaint	66	1,161

Meters of 98 to 104 per cent accuracy are reckoned as correct; meters over 104 per cent accuracy are reckoned as fast; meters below 98 per cent accuracy are reckoned as slow. Ninety-six meters were found fast on periodical test and cash refunds amounting to $375.86 were issued to customers who had not complained on bills rendered. Refunds for the fast or creeping meters tested upon complaint amounted to less than $200. The total cost of these investigations amounted to $3,134.70, or $2.70 each.

Electrical Construction

THE SMALL DEALER'S INVENTORY.

By Richard E. Smith.

An electrical dealer in a Western city recently stated that he had not taken an inventory in the twenty-five years he had been in the game. When asked how he knew whether the business paid, he said, "Well, I manage to pay my bills and I seem to be accumulating more stock all the time, so I must be getting ahead." The word "accumulate" was well chosen. It means to heap or pile up. The prosperous merchant does not hoard. He keeps things moving and an inventory is a *prime mover*.

It is said that a period of financial stringency affects the small dealer sooner than the large concern because the latter can live on the interest on its debts. There is some truth in this sally. If a large corporation has need of an occasional statement of the business, it is far more important for a dealer handling a monthly business of $3,000 to know the whereabouts of his modest capital. He cannot afford to face a crisis without a thorough knowledge of his resources.

The small dealer should have a good monthly statement of his affairs and a complete inventory every six months. Lots of things that can be located only in an inventory can happen in a year. As an annual inventory generally takes twice as long as one taken semi-annually, on account of the errors that creep into the stock room, there is no very good argument against the semi-annual statement. This applies only to the case of the small dealer. In large concerns maintaining an elaborate store room, the case is altogether different.

The old conception of an inventory was a list of stock on hand which was obtained after a long period of night work and which was simply an aid towards computing the firm's present worth. In modern business the inventory has so many purposes that the item of stock on hand is little more than a side issue.

To make the discussion clear, the typical case of the City Electric Company can be taken and followed through an inventory. This inventory is taken in January and again in July.

Immediately following the Christmas rush, the stockman and the boys about the shop begin putting the stock in shape. As the stockman has at all times an eye for order, this is no arduous task and requires only spare time. By the first Saturday in January everything is ready and the real work begins.

All departments of the business are closed at noon on this Saturday so there will be absolutely no interference from outside sources. All hands—owner, foremen, clerks, journeymen, errand boys—everybody on the payroll is put to work. They work till midnight and are at it again at eight o'clock Sunday morning. At ten o'clock Sunday night, everything has been counted and all the cards are in. It has been very hard work, but then that is characteristic of inventory and every one is glad to have it all in one dose.

Of course none of the clerical work has been done. That will take some time, but every item of stock has been taken and the regular work can go on without any further interruption. It may be well to say here that the employees get no pay for this work, except their regular time for Saturday afternoon. When the inventory is finished, about two weeks later, the house entertains all hands at a dinner. This is a means of developing good feeling and is ample reward for the men's extra work. At this time the host can give the men such information gleaned from the inventory as he thinks advisable. Men are naturally loyal, and appreciate little tokens of confidence. If conditions warrant a general raise in wages, this is the ideal time to make such an announcement. If, on the other hand, business is discouraging, a frank statement to the men will win their support.

The system followed in taking this inventory is very simple. Each man takes a section of the stock room and notes on a card the quantities in each bin. The presence of a card on a bin shows that it has been counted. When everything has been counted, the men divide in pairs. One man walks by the bins, calls the item to the other man, who writes it down, and destroys the card. The absence of a card from a bin now shows that it has been checked.

The loose sheets (a regular inventory form bought from the stationers) are sorted in the office and are finally bound in book form and labeled with the date, "Jan.—1913." A series of these books is a vital history of the business. The general cost cards described in a previous article are of untold value when pricing inventory sheets.

The active stock, however, is generally the simplest part of the inventory. Real estate, leases, furniture, fixtures, samples, tools, machinery, office supplies—all must be accurately accounted for. The first two are readily cared for. Furniture and kindred items deserve some study, for their appraisal involves depreciation. The following is an excellent method for recording such items. Before inventory each fixture is given a number, which may be a brass tag or some kind of sticker. "Fixture" in this sense means every desk, chair, counter, section of shelving, typewriter,—any appliance used to conduct the business. In a record book, each item has a full page whose number corresponds with that of the fixture. On this page, full information about the fixture is entered while on the inventory sheets all that is necessary is the number and a brief description for easy identification. If further information is wanted it is quickly obtained from the record.

For instance, a desk used in the office would be assigned No. 49, while the swivel chair belonging to the same would be No. 50. On page 49 of the record we find the heading "Oak desk—roll top," and the entry "Used by Hammond. Bought of Brown Furniture Company, February 10, 1912. Cost $45.00." At the time of purchase, the useful life of the desk is estimated as twenty years. This is noted in the record. "Depreciation $2.25 per annum." Thus the record will read as follows:

"July, 1912.....$43.88"
"Jan., 1913..... 42.75"

and so on, simply taking out the factor of depreciation each time. On page 50 of the record similar information about the chair is noted, and so on through the book.

A similar record may be kept of shop tools, machines, ladders, benches, bins, etc. If a fair estimate of the useful life of an article is made, this system is very accurate and is far superior to the method of appraising articles each year.

Such built-in fixtures as material bins, shelves, benches, etc., are the subject of much discussion. Some claim that their only value is what they would bring at a forced sale, which would simply be the value of second-hand lumber. This is obviously unfair. Let us suppose that a work-bench cost $8.00, of which $5.00 was

for material and $3.00 for labor in making. As second-hand lumber in short lengths the material is probably worth not over $1.00. On the other hand, to take the full cost of $8.00 is unfair, as a new bench could be obtained for this price at any time. A good way is to take the full cost of such fixtures and cut it in two and not make any further allowance for depreciation. Thus the workbench would be entered at $4.00. It is assumed that sufficient additions and repairs are made to such fixtures each year to offset any wear or breakage. The case is different from that of a desk where a scratch in the varnish affects the value.

This numbering system should apply only to fixtures and tools whose size makes them more or less permanent. Thus a stepladder may be considered a fixture while a die-stock should come on the miscellaneous list. This last must be made up each time inventory is taken.

The great advantage of the numbering system that has been described is that, once an article is entered on the record, all that is necessary in future inventories is to see if the fixture is still in use and in fairly good condition. In case of fire, this record will be welcomed by the adjusters and will help all concerned to an equitable settlement of the claims.

Another difficulty in obtaining an exact statement of the condition of business is that of uncompleted work. This is quickly settled by the cost system that has been described in a previous article. By going through the envelopes in which the time and material records are kept all the costs to date can be obtained. As the shop is closed and the payroll made up at the time inventory is taken, no further adjustment is necessary. In the case of wiring jobs where the rough work has been completed and the finish has not been put on, a partial completion charge of 75 per cent of the contract price is a satisfatcory method of obtaining their value as bills receivable.

All that has been accomplished thus far is a statement of the present worth of the City Electric Company. This is only one of the results of the semi-annual statement.

A thorough overhauling of any stock brings considerable damaged stuff to the surface. The inventory should show all such as being in "bad order," "broken," "scrap," etc. Later the stockman can go through, locate this defective stock and dispose of it to the best advantage. This is the first by-product of the inventory.

A study of the inventory shows that of twenty toasters recorded in the previous statement, seventeen are still on hand. Here is information for the sales and advertising departments. Inventory brings dead stock to light.

Further examination of the statement shows that the wiring business is using one-third of the investment and producing only one-fourth of the volume of business. The inventory is calling attention to inequalities.

By dividing the wiring jobs into two classes, those running under $100 and those over $100, it is found that the latter are paying the better profits. This seems to indicate that it will pay to specialize on large work. More than likely, the real cause is slack methods in the shop. Small work is the first to suffer from lack of supervision. The inventory is showing up weak points in management.

If the concern is a stock company, this statement is a basis for computing dividends. It will be of prime importance in obtaining insurance, making financial statements to mercantile agencies, as a basis of taxation, as an argument when asking for credit, as a valuation if the business is for sale. And a result of no little merit, is the satisfaction it affords the owners. No guess work here; they know!

Of course a great deal of figuring must be done to get all this information. If it is anywhere near possible the dealer should have an adding machine. He needs it to make up his daily sales records and for many other purposes besides inventory. Unfortunately such machines are expensive, but then, so is a bookkeeper. If the small dealer can appreciate the value of accurate information in his business, he will probably stretch a point and get an adding machine. If it is entirely out of the question, let him make arrangements to borrow one from his bank. Possibly he can get some of his neighbors in other lines of trade to club together and get a neighborhood machine.

Year by year the game is developing a keener edge. One by one the oldtimers who see no need of changing their methods are falling behind and dropping out. Their place is taken by aggressive fellows whose handicaps are turned into assets—men who capitalize their brains. The small dealer must climb out of the rut—he must take an inventory, not merely of his stock but of his other resources. Of what value is the location of his store? Is its appearance a resource? Are his show windows paying dividends? Is his advertising well placed? Are his salesmen getting results? Is he putting forth his efforts in right lines? Is he *making good?* Modern accounting methods can answer these questions. The battle is not always to the strong; it is always to the wide-awake.

A British trade paper states that an electrician of Rotterdam, Netherlands, has discovered a method of maturing cheese by electricity. The method consists in subjecting fresh cheese to an alternating current for 24 hours, which gives all the properties acquired by aging.

ORGANIZATION AMONG ELECTRICAL INSPECTORS.

By Ben W. Clark.[1]

One of the most important factors of efficiency connected with the proper management of an up-to-the-minute electrical inspection department is uniform interpretation of the rules adopted to govern the installation of electric wiring and apparatus.

In large inspection departments this is quite a serious problem to the chief of the department, and various methods are being tried to bring it about.

The National Code, which has been adopted almost universally, is to the electrician and inspector as the Bible is to the Christian, in so far as there are divers constructions placed on some rules. So a so-called misinterpretation of a rule can easily be accounted for.

We have adopted an idea in Detroit that will retain a uniform interpretation in a way far better than some others, which is as follows.

In February, 1912, we organized an electrical inspectors' club. Our club is composed of the underwriters inspectors, the municipal inspectors and three inspectors from towns adjacent to Detroit.

The Club meets the first Wednesday evening of each month, except July and August, to discuss the Rules and the proper application of them to the various methods of construction that are met on regular field inspection.

In addition to said discussions, we have, from time to time, some one who is prominent in the electrical field meet with us and give us a talk on the particular branch he may be specially familiar with.

This makes our meetings not only instructive but entertaining. Our annual meeting is celebrated with a supper, to which a few prominent electrical men are invited, who are expected to deliver short addresses or papers on some interesting electrical subject.

Our regular meetings are held at the offices of the Inspection Department of the Public Lighting Commission, and inspectors and other electrical men who happen in our city on the first Wednesday of any month but July and August are cordially invited.

Since the organization of the Club, the efficiency of our inspectors has increased quite perceptibly. In other words, we learn from one another's experiences in the field.

Our membership at present is 17.

Our officers are president, vice-president, and secretary-treasurer.

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1 Chief electrical inspector of Detroit, Mich., and president of the Western Association of Electrical Inspectors.

NOTES ON GROUNDING OF ELECTRICAL SYSTEMS.[1]

By H. P. Liversidge.

During the past few years a considerable amount of investigation and experimental work has been done covering the subject of earth connections, or grounding, for electrical circuits.

A clearer understanding of this important subject has been made necessary by the marked increase in transmission and distribution voltages required for supplying energy for light and power uses. The increases in pressure have necessitated additional precautions for safeguarding against troubles due to direct electrical connections between high-voltage systems and those of relatively low potential.

The theory of earth connections has been so broadly covered in various technical papers during the past few years, that it will not be necessary here to dwell upon it.

The present article rather will discuss somewhat briefly the practical side of the subject as it relates to the methods which have proven most effective in obtaining the results desired.

The term "grounded," or "earthed," when applied to an electrical circuit is more or less relative, and depends largely on the characteristics of the system in question. Speaking broadly, every electrical circuit may be regarded as "grounded;" the degree of ground being determined by the resistance to flow of current from the circuits to earth.

Practical considerations, however, establish certain values for ground connections. These values while comparatively low may vary considerably, depending on the protection which is required.

For station work, where the ground connections may be called upon to carry large currents, the resistance should be low, and may range from almost negligible values to a maximum of one or two ohms.

In secondary-distribution work, where protection is desired against accidental contact with high-voltage circuits, the resistance of the gound connection may safely be several ohms higher than a satisfactory station ground.

In the cases of telephone, telegraph, and signal systems, a slightly higher resistance than the values noted may be entirely practicable. The prime consideration in the installation of safe earth connection should be the fact that the current-carrying capacity of the grounding device is sufficient at all times to prevent a dangerous potential difference between the grounded circuit, the apparatus which it grounds, and the earth.

Before discussing the details of ground connections it may be well to outline very briefly the methods in common use for the grounding of various types of electrical systems, as follows:

1. Generating Stations and Substations.
tions.
2. Alternating-Current Distributing Systems.
3. Telephone, Telegraph and Signal Systems.

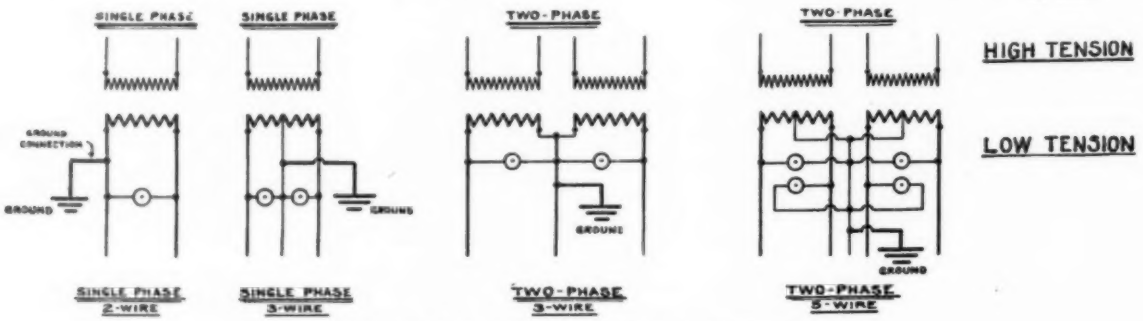


Fig. 1.—Ground Connections on Two-Phase Circuits.

Generating Stations and Substations.

Systems including generating stations and substations deal with relatively large amounts of energy. The ground connections must therefore be correspondingly heavy to properly safeguard the operating attendants and the equipment. Particularly is this true in high-voltage stations, where the possibility of trouble due to insulation breakdowns must be carefully guarded against.

The various types of equipment in generating stations and substations which in general should be connected to earth include:

1. Metal frames of all generating, transforming, and regulating apparatus.
2. High-voltage switching mechanisms.
3. Metal switchboard frames and the cases of all switchboard instruments.
4. Secondary circuits of instrument transformers.
5. Lightning-arrester equipments.

The question of providing separate grounds for circuits of different voltages in the same station is of importance, and must be considered. It is highly desirable if lightning-arrester equipments are installed on these circuits of different voltages, that the arrester-grounds be kept entirely independent one from the other. To take an illustration: a substation receives energy at 13,200 volts and transforms it to 2,400 volts for commercial power, and to 600 volts direct current for railway purposes. The grounding installation for maximum safety in such a station would be an entirely separate ground system for the 13,200-volt arrester equipment, and possibly a common ground connection for the 2,400-volt and 600-volt arresters. The danger which must be guarded against in all cases is the possibility of a common ground becoming ineffective, due to breaking of the ground wiring or other causes, with consequently the chance that high voltage may be impressed upon the lower voltage system, resulting in damage to the lower insulation.

In making ground connections between the smaller secondary wiring and the "station" ground bus, common practice is to run in iron pipes the grounding wires which are generally used. While this method safeguards the wire from mechanical injury, the iron pipe increases the self-induction of the ground circuit and renders the connection practically useless when a heavy current must pass over the ground wire. To avoid such a condition, the wire in all instances should make metallic contact with both ends of the iron pipe; in this way the conduit forms part of the electrical circuit.

Alternating-Current Distributing Systems.

This class of service relates to the supply of electricity for power and lighting, through the medium of high-tension circuits from the substations of operating company, and through the medium of "step-down" transformers located at or near the consumer's premises, and low-tension distributing wires. The low tension brought to the consumer is usually 110 or 220 volts, depending on the class of service required.

It is very evident that such a system which supplies electrical energy at low potentials transformed from a comparatively high-voltage system is subject to the danger of excessive voltages im-

1 A paper read at the eighteenth annual convention of the International Association of Municipal Electricians; slightly abridged.

pressed on the low-tension circuits, caused by crosses between the high-tension and low-tension lines, or by lightning disturbances on the line. While the number of instances in which troubles are due to these causes is almost negligible, still, when absolute protection is desired, a proper ground connection on the low-tension side should be installed. It is usually quite sufficient to ground only the neutral of the low-tension circuits, although in some instances the transformer cases themselves are also connected to the grounding-wire.

In systems where the general practice of grounded low-tension service is followed, the method consists of connecting each individual low-tension service to a ground terminal. The connection may be either in the consumer's premises, or made directly at the base of transformer pole. When made at the service entrance, the ground is usually to a water-pipe. This method of grounding, however, cannot always be followed, due to the fact that in some installations a water-pipe ground is not available. In certain installations the practice of installing a continuous ground-wire is used. The wire is grounded at uniform distances, and serves as a means for connecting together all transformer secondaries. This latter method offers the advantage of practically insuring a permanent ground connection of comparatively low resistance. However, where electric traction lines parallel such a system there is great danger of the low-voltage circuits of the distribution system carrying part of the trolley return current; the danger being particularly likely when the rail bonding of the traction system is faulty.

Figs. 1 and 2 give examples of typical alternating-current distribution systems, single phase, two phase and three phase, and indicates the points at which it is found desirable to ground the low-voltage circuits.

Telephone, Telegraph and Signal Systems.

In such installations the ground is made particularly to protect against possible crosses with high-voltage lines. In some instances the reason is also to provide an earth connection which may be used for regular operating conditions. In any event the conductors of the system always are comparatively small, and the amount of current that can be transmitted without melting the wires is low. The ground connection is deemed sufficient when it will protect against accidental crosses with series arc-lighting circuits. Here the maximum current does not exceed 10 amperes.

When metal signal-boxes are installed on telephone, telegraph, and signal systems, and are mounted on wooden poles or other insulating supports, care should be taken to properly ground the metal cases of the boxes as a protection against their remaining charged, due to accidental crosses of the signal circuit with high-voltage circuits.

Ground Connections.

As has been noted already at the beginning of the present paper, the resistances of ground connections may vary through a considerable range of values and still be satisfactory, depending entirely upon the service that is demanded of the connection. Since this is true, it is quite evident that the precautions which must be observed in one case may not be worthy of consideration in another. It may be said with a fair degree of assurance, that the characteristics of a ground connection are practically limited by the expenditure which there is willingness to incur in securing the results desired.

Numerous devices for obtaining satisfactory ground connections have been devised from time to time. In the light of present-day experience most of them are little more than worthless extravagances. One of the oldest practicable methods for obtaining a ground connection consisted of burying a large metal plate, preferably copper, in the earth. A moist locality was selected whenever possible, and the plate was carefully imbedded in a thick layer of coke or charcoal. This method of grounding usually gave rather indifferent results, and as a rule was not dependable in operation.

Recent experiments and observations have defined exactly the more important factors determining a good ground connection. Within certain wide limits, it is possible to readily secure a ground connection of the character desired, provided the necessary precautions are taken in installing the ground terminal.

During the past few years the writer has had the opportunity of collecting a considerable amount of data on the subject of ground connections, particularly in generating stations and substations where the service requirements are very exacting.

The observations made have covered a considerable number of tests of ground installations in various sections of a metropolitan district and its environs. The locations of tests were determined in the majority of cases by the station locations, where the grounds were installed in connection with the grounding of electrical apparatus in operation in the stations. Geographically, the whole district covered approximately a twenty-mile radius.

The tabulation of results given in Table I covers some few of the characteristic tests which were made. While the data given are in a measure incomplete, it is interesting to note certain of the points brought out in the results obtained.

In nearly all the experiments and particularly in all those which are listed in the table, the ground connection consisted of a galvanized-iron pipe of approximately two inches outside diameter, driven to various depths, ranging from 6′-0″ to 12′-0″, as noted in the table. An examination of the results obtained indicates a wide range in the resistances observed. The resistance values ranged from a minimum value of 0.01 ohm to a maximum value of 138.0 ohms. Various grades of soil were encountered, with corresponding variations in the amount of contained moisture; and these conditions, together with the various depths at which the grounds were driven, indicated very obviously the factors which determined the results secured. The general average of some other twenty-five different readings not specifically mentioned in the Table I, but representing fairly average conditions in reference to charac-

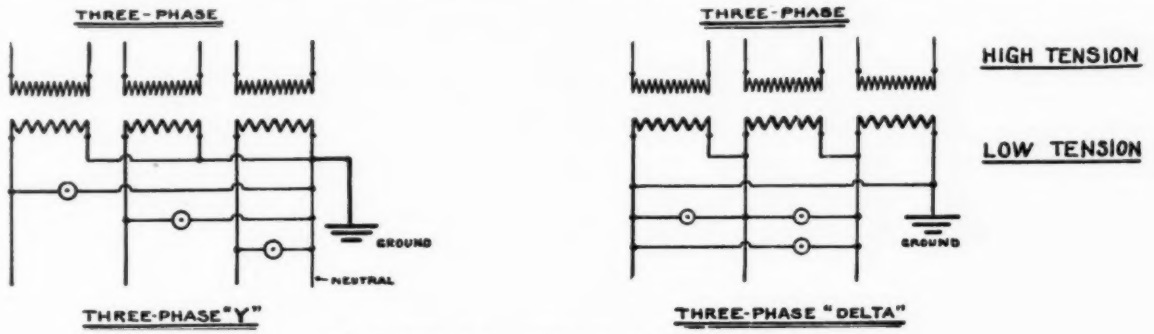


Fig. 2.—Ground Connections on Three-Phase Systems.

TABLE I.

No.	Character of Soil.	Contained Moisture.	Depth of Ground Connection.	Contact Resistance Ohms.
1	Gray Clay	Water at 4'-0"	8'-9"	0.88
2	Yellow Clay	Wet	10'-0"	5.40
3	Red Gravel	Moist	10'-0"	18.00
4	Top Soil	Moist	10'-0"	0.077
5	Yellow Clay	Wet	10'-0"	0.15
6	Clay	Moist	6'-0"	18.50
7	Clay and Gravel	Springs		20.70
8	Clay	Springs	9'-6"	6.10
9	Top Soil	Moist	9'-0"	0.10
10	Clay and Red Gravel	Moist	7'-0"	0.064
11	Cinders and Wet Clay	Moist	7'-0"	9.71
12	Top Soil	Moist	10'-0"	1.10
13	Clay and Top Soil	Moist	12'-0"	8.00
*14	Fine Gravel	Moist	6'-0"	0.01
15	Yellow Clay	Slightly Moist	6'-0"	138.00

*NOTE: In this particular installation the ground pipe was driven to a depth of 6'-0" at the bottom of a building excavation approximately 35 feet below the ground level, giving in reality a depth of ground connection of 41 feet.

ter of soil, contained moisture, etc., give the following contact resistances:

Clay .....13.60 ohms
Gravel ..... 6.01 "
Top soil..... 1.80 "

From a study of the conditions affecting the results obtained above, it was found that the three following factors may be considered as fundamental in determining the quality of the earth connection:

First, character of the soil; second, amount of electrolytic moisture present around the grounding device; third, area of contact surface between ground connection and earth.

In order to undertake further analysis of these factors, consideration may be given briefly to each in turn.

(1) *Character of Soil.* As indicated in the above results, the highest resistance was obtained in a clay bed, while the lowest average resistance was obtained where grounds were installed in top soil or garden earth. Particular instances, however, point to the fact that average results are by no means a safe guide in determining what may or may not be expected of individual grounding installations. As an example: in Test No. 5 a ground made in yellow clay gave a resistance of only 0.15 ohms, whereas Test No. 8 gave a resistance of 6.1 ohms. Both grounds were installed under practically identical conditions, but the two were located in entirely different sections of the city. It is more than likely that in Test No. 5 certain grounding conditions existed which could not be determined by ordinary means of observation.

Again, Test No. 14 made in a bed of fine gravel gave a contact resistance of less than 0.01 ohms, whereas Test No. 3 with practically the same grade of soil gave a resistance of 18.0 ohms. In these two latter instances, Test No. 14, as pointed out in the footnote to table, was made in a considerably lower stratum of earth than was Test No. 3.

It is therefore plainly evident that in particular installations extremely wide variations may be expected from the average results given above.

(2.) *Amount of electrolytic moisture around the grounding device.* Numerous tests relating to this phase of the subject have shown conclusively that the passage of electric current from a conductor to the earth is by means of electrolytic conduction. In all the tests which already have been cited, this fact is indicated very clearly. In all tests it was found that a ground installed in practically dry soil gave a very high resistance value. Whenever such conditions existed it was also found that a saturated salt solution poured around the grounding terminal lowered the resistance materially and in a very short time.

Table II gives the changes of resistance of some of these comparatively high resistance grounds, when a salt solution was made use of:

An examination of the results shows a lowered resistance of practically 50 per cent of the initial value.

It may be noted further that in all the tests given in the results tabulated herein, a salt solution was poured around the ground terminal at the time of installation. It is quite evident therefore, that wherever electrolytic moisture is not already present the addition of some soluble electrolyte is absolutely necessary if a satisfactory ground shall be established.

(3.) *Area of contact surface between ground connection and earth.* In almost all the tests made, a current of approximately 25 amperes was passed through the ground terminal for a period of time ranging from thirty minutes to two hours. This was done in order to determine what changes, if any, would take place in the resistance of the ground connection due to the heating effect of the current.

In many of the tests a ground connection of comparatively low resistance was found to withstand a momentary flow of several hundred amperes without appreciable change in resistance.

The conditions of such tests are rather abnormal, and the point of perhaps greater consequence is a consideration of the changes in resistances due to a flow of current during a considerable period of time.

In most of the tests it was found that the pipe connections or other grounding devices were able to carry a current of 25 amperes continuously without any marked increase in contact resistance.

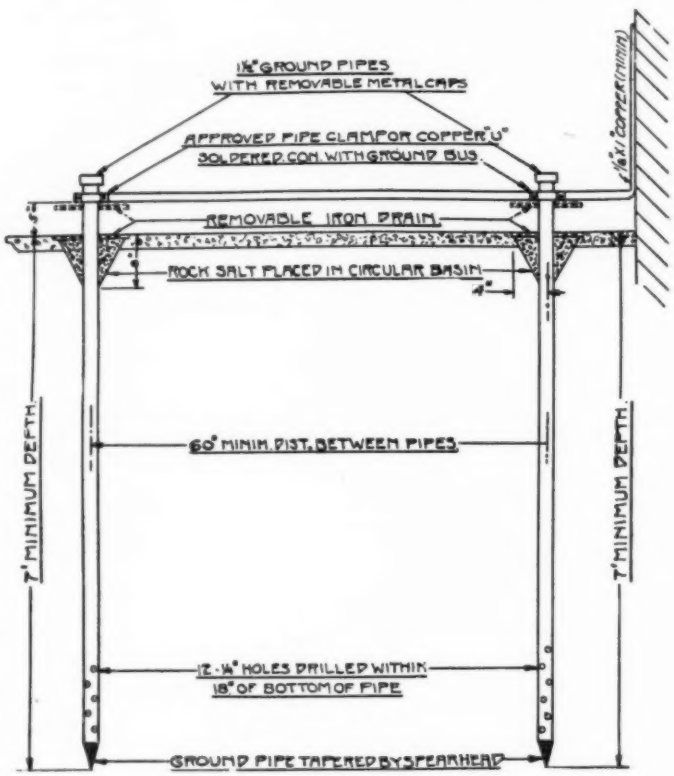

1¼" GROUND PIPES
WITH REMOVABLE METAL CAPS
APPROVED PIPE CLAMP FOR COPPER "U"
SOLDERED CON. WITH GROUND BUS
#6 x/ CONCRETE WIRE
REMOVABLE IRON DRAIN
ROCK SALT PLACED IN CIRCULAR BASIN
4"
7' MINIMUM DEPTH
60" MINIM. DIST. BETWEEN PIPES
7' MINIMUM DEPTH
12-¾" HOLES DRILLED WITHIN
18" OF BOTTOM OF PIPE
GROUND PIPE TAPERED BY SPEARHEAD

Fig. 3.—Specifications for Pipe Grounds.

It was further found that any change in resistance which did occur was usually during the first hour of test, and that after this period the conditions remained practically constant.

The results which were obtained indicated in most cases that the limiting feature to the current-carrying capacity of a ground connection is the ampere discharge per unit area of contact surface. If the current density was high enough to drive off the electrolytic moisture, as a consequence of excessive heating of the earth immediately surrounding the grounding device, then the contact resistance would gradually increase.

Where conditions were favorable to a constant supply of moisture either furnished externally to the grounding device or incorporated in the device itself, or where the area of contact surface was sufficiently large to establish a low current density, then the current resistance of the ground connection was practically constant. These facts have suggested the great advantage of a grounding device which in itself shall combine a self-contained source of electrolytic moisture with ample design of area of contact surface.

In most of the tests which were performed the ground terminal consisted of a galvanized-iron pipe approximately two inches in diameter, pointed at one end to permit it to be readily driven into the earth, and with the lower end drilled by perhaps fifteen quarter-inch holes, within 18 inches of the end of the pipe.

A Typical Installation of a "Pipe Ground."

A typical installation of two ground pipes arranged in parallel for use in a substation grounding is indicated in Fig. 3, and the diagram shows clearly the construction made use of. After the pipes had been driven into the earth a concentrated salt solution was poured down them, and the small holes in the bottoms of the pipes allowed the solution to saturate the surrounding earth. In this way electrolytic moisture was provided in order to establish a low-resistance connection. Further, there was placed an additional amount of salt around the top of the pipes as indicated in the illustration, and several quarts of water were then poured in.

Such an arrangement of pipe grounds as this has proven very effective, and from experiences met with in installing this type of grounding construction, a design of grounding terminal has been evolved which it is believed fulfills all the necessary conditions for a satisfactory grounding device, and one which offers certain additional features found to be highly desirable. This new type of terminal or grounding-box is shown in Fig. 4.

The device is essentially an "iron pipe" installation having an enlarged base in order to accomplish the results which are necessary to obtain a satisfactory ground as outlined earlier in this paper. The ground box or enlarged base consists of a hollow cylindrical iron shell about five inches in diameter and 12 inches in length, having a number of elongated ribs extending radially outward from the cylindrical body. The box is filled with a special hygroscopic compound which is held in place by a galvanized-iron mesh. Electrical connection to the box is made at the top by means of a one-inch galvanized-iron pipe screwed into a suitable clamping lug, the whole device being heavily galvanized to protect against possible corrosion.

TABLE II.

Location	Nature of Soil	Resistance without addition of Saline Solution	Resistance one hour after pouring Saline Solution
1	Dry Gravel	131.5 ohms	59.5 ohms
2	Moist Clay	20.7 ohms	10.7 ohms
3	Moist Clay	18.5 ohms	8.5 ohms

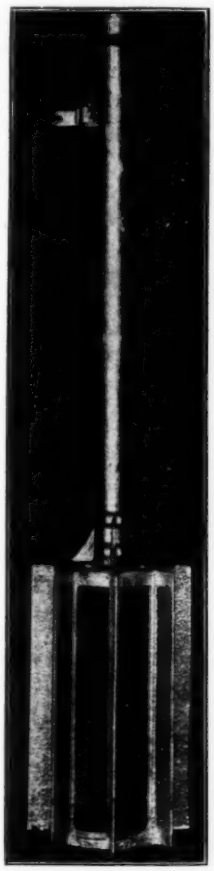


Fig. 4.—New Type of Ground Terminal.

In this type of grounding terminal the contact surface is approximately 500 square inches, and therefore is able to withstand heavy current discharges without undue heating. The compound contained in the ground receptacle being hygroscopic in nature, and in addition containing soluble electrolytes, assures a contact resistance of comparatively low value and one which is fairly permanent in nature. Therefore in installing this type of "ground" it is no longer necessary to take additional precautions to insure electrolytic moisture around the ground terminal, which on the other hand is always necessary in the case of a pipe ground. Furthermore, the pipe extended from the top of the box provides a very rigid connection so that there is little danger of the circuit being broken due to mechanical injuries.

The method of ground connection offered by such ground box furnishes a path of very low inductance and so is therefore particularly suited to carry off discharges of abnormally high frequency.

Electrolytic corrosion causing a rapid deterioration of the ground terminal, particularly where dissimilar metals are exposed to the action of the current, as copper, lead, etc., is very effectually guarded against by a heavy galvanized coating over the entire box. This precaution insures an exceptionally permanent type of ground connection and serves to protect against any deterioration due to electrolysis caused by a flow of current or chemical reaction due to the soluble electrolytes in contact with the metal body.

In conclusion, it may be said that within certain limits the general subject of obtaining a satisfactory ground connection resolves itself into a consideration of engineering judgment, coupled with the amount of expenditure which is deemed expedient in order to secure the results desired. These factors involve a study of the selection of location, methods of installation and maintenance.

In the last analysis it will be found that after all precautions suggested by engineering knowledge have been exercised, specific cases will continue to arise of what may amount to impossible earth connections, and the results obtained will indicate an apparent disregard of all the laws relating to the establishing of a practically perfect ground.

Utah Coal Production.

The production of coal in Utah in 1912 reached the record figure of 3,016,149 short tons, valued at $5,046,451, an increase of 502,974 tons over the output for 1911.

The coal fields of Utah are important and the areas known to contain workable beds aggregate more than 8,000,000 acres, in addition to which there are about 1,250,000 acres which may contain workable coal.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Running Concealed Circuits in Finished Houses.

Sometimes a contractor is asked if it is possible for him to wire an old house without tearing up hardwood floors, or disturbing the plastering of an elegantly finished room, the floors of the second story being hardwood or parquetry floors and the plastering being expensively decorated. It is very seldom that the entire second floor is of hardwood, and if it is possible for him to tear up the boards of the flooring at some point, and use the device as shown in Figs. 1 and 2, the circuits can be easily run without injury to floor or plaster.

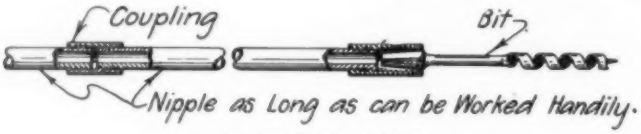


Fig. 1.—Sketch of Tool.

In making the tool a 1-inch or a 1.25-inch auger bit is welded in the end of a short piece of pipe in the way shown in Fig. 1, the other end of the pipe being threaded. Then a number of nipples, or short lengths of pipe with both ends threaded, are secured and one end of each nipple is supplied with a standard coupling. Thus the tool is completed. By the use of as many or as few nipples as are necessary it can be made any desired length; where a more convenient method is not available the tool can be turned with a Stilson wrench.

Sometimes the boring has to be done along a line making an angle other than 90 degrees with the joists or whatever else is being bored. In such a case it is a good plan to draw a chalk line straight from the baseboard, through the center of the outlet and to the point where the drilling is to start. This line will serve as a guide so that the workman can keep the tool he is using at the proper angle all the time. When boring at an angle he must be careful to make allowance for the spring in the pipe, and also for the spring in the bit when it goes from one joist and strikes the next one. He can estimate the proper allowance and keep his drill to whichever side of the line it should be kept.

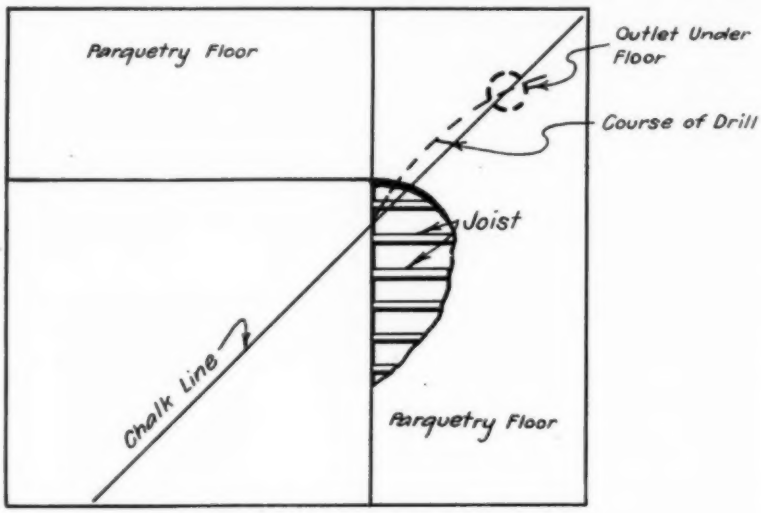


Fig. 2.—Method of Boring to Outlet in Ceiling.

As soon as the drill hits the outlet, the helper can uncouple the bit, from the handhole at the outlet, and a piece of wire can be shoved through the pipe until it comes through the outlet. The nipples can then be uncoupled and pulled back, leaving a line from the outlet to the point where the drill is started, this wire being used as fish wire.

By this method expensive houses can be wired.

Leo Schistzinger.

Wiring A Signal Board.

A prize board was to be wired with 30 lamps, 15 red ones and 15 white ones, and the board was to be about three feet square when it had been completed.

It was desired that the arrangement be such that when any one of 30 pear-shaped push buttons (which were to hang in a cluster) was pressed it would light either a red or a white light, according to the wishes of the operator of the board.

Fig. 3 illustrates the wiring scheme that was adopted, the diagram showing four of the lamps and four push buttons. When the floor push is operated the circuit for the red lights is closed and that of the white lights opened. When, on the other hand, the floor switch is released the white-light circuit is closed and only white lights can be flashed. The circuits work splendidly.

E. A. Buell.

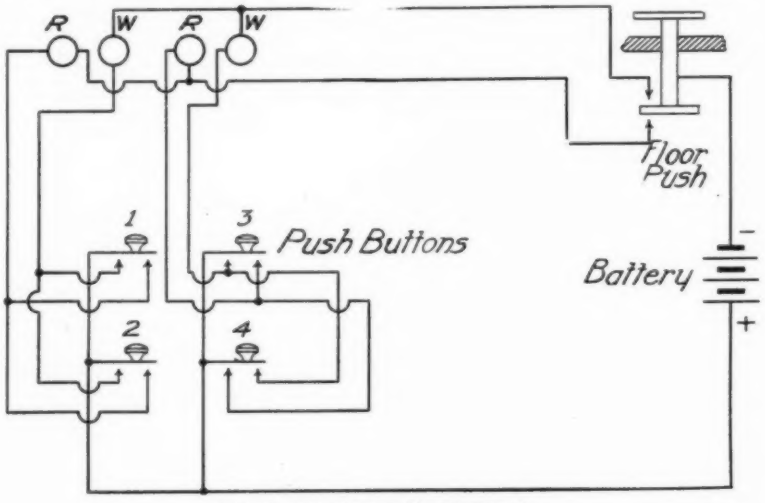


Fig. 3.—Circuits on Signal Board.

Public Service Commissions

CALIFORNIA.

The Railroad Commission rendered a decision authorizing the Tulare County Power Company to issue ten promissory notes in the aggregate face value of $50,000, secured by $66,500 of bonds, to replace similar notes held by Thomas C. Job. The Commission denied the application to pledge $4,000 of bonds to secure $3,243 interest on notes held by Mr. Job.

A decision was rendered authorizing the Pacific Gas & Electric Company to execute a general lien mortgage to the Guaranty Trust Company of New York and William C. Cox, and to issue thereunder $5,000,000 of bonds. Authority was also granted to issue $4,500,000 of notes, and $5,000,000 of bonds as collateral thereof.

A decision was rendered petitioning the Burbank Electric Light & Power Company to sell its system to the city of Burbank for $3,212.50.

The Lindsay Home Telephone & Telegraph Company was given authority to issue $1,644 of stock in exchange for property.

A decision was rendered denying the request of the Oro Electric Corporation for a rehearing of the application for permission to serve certain portions of San Joaquin County and the city of Stockton.

Authority was granted to the Delano-Linns Valley Telephone Company, to issue $250 of stock, and to extend its system in Kern County.

A decision was rendered authorizing the Home Telephone Company to issue $90,000 of bonds for the purpose of discharging indebtedness and making improvements.

MICHIGAN.

Use to which a telephone is put rather than its location, should be the determining factor in fixing telephone rates, according to a ruling of the State Railroad Commission. The decision was made in an opinion on the case of Sheridan E. Gardiner, a Mt. Pleasant physician, against the Union Telephone Company, of that city.

Dr. Gardiner has two telephones, one in his home, and a second, an extension of the first, in his office, 800 feet from his residence. Till recently Dr. Gardiner paid a residence rate on both. He filed a protest with the Railroad Commission when the telephone company raised his rate on the office extension to the business standard, but the Commission pronounced the increase a just one.

OHIO.

Governor Cox has appointed as members of the Ohio Public Utilities Commission, which on August 8 succeeded the Ohio Public Service Commission, O. H. Hughes, W. L. Dechant and Edward L. Doty. Mr. Hughes was a member of the former commission with O. P. Gothlin and J. L. Sullivan, the latter two retiring with the dissolution of the old commission.

PENNSYLVANIA.

The schedule for telephone rates proposed for all companies operating in Pennsylvania was discussed at a hearing in Harrisburg, Pa., before the newly established Public Service Commission. The rates discussed were the tentative ones prepared by the old State Railroad Commission. Those who appeared before the Commission argued that the establishment of maximum rates was wrong, because it would work a hardship on many companies. The Commission took no action, as several companies, including the Bell system, were not represented.

The hearing, which was the first to be held by the new Commission, was attended by about 75 representatives of independent telephone companies. The schedule submitted by the Commission is elaborate, covering general flat and message rates, with zone rates for Pittsburgh and Philadelphia. The principal objection was that conditions attending operation in various parts of the state were so different that it would be difficult to work out an equitable system of charges. The retention of the flat rate was strenuously urged because of the advantages it had in competition.

The new Commission is composed of the following members: Nathaniel Ewing, chairman, appointed for ten years; S. L. Tone, nine years; Samuel W. Pennypacker, eight years; Emory R. Johnson, seven years; M. J. Brecht, six years; C. F. Wright, five years; Frank M. Wallace, four years.

WISCONSIN.

In an order recently issued, the Wisconsin Railroad Commission has revised its standards for gas and electric service. The order comes as a result of five years of study of the old standards and follows a public hearing given by the Commission in the city of Milwaukee on April 22, 1913, which was attended by representatives of municipalities, gas and electric utilities and others interested. The original standards of service to be furnished by the gas and electric utilities of the state were not altered materially, but it was necessary to define somewhat differently the practices of the utilities in maintaining those standards. Slight changes were found desirable in the rules covering pressure variation for both gas and electric service. The minimum gas pressure at a consumer's outlet is increased from 1.5 inches of water to two inches, the maximum remaining six inches, and not greater than twice the minimum pressure, as before. In the matter of voltage variation, the old rule permitting a variation in pressure of six per cent of the minimum will now apply during lighting hours to utilities operating in cities of less than 1,500 inhabitants only. For utilities operating in cities of more than 1,500 population, it is provided that there shall be established a standard voltage for the entire constant-potential system and that this voltage shall be maintained within three per cent during lighting hours. On power circuits, and on lighting circuits during other than lighting hours, the voltage is to be maintained within ten per cent of the standard. That these standards may be compiled without the necessity of Commission test, it is provided that each gas utility shall maintain a portable graphic recording pressure gauge and make frequent measurements throughout the system and that each utility furnishing electric service to more than 250 consumers shall own and keep in service at least one portable graphic recording voltmeter. Each utility must make a sufficient number of voltage surveys to indicate the service furnished from each transformer and feeder and to satisfy the Commission of its compliance with the voltage requirements.

The questions of meter accuracy, methods of test and meter records are given considerable prominence in the revised standards. Henceforth each gas meter is to be tested and overhauled once in four years, instead of once in three years as formerly, and it is specified

that at least two consecutive test runs must be made which agree within 0.5 per cent. The rule requiring the keeping of meter tests records has been elaborated and, as revised, each gas and electric utility is required to keep a complete and detailed record of every meter, to include the history of the meter, its various tests, its indentification, etc. The old rule which required that the error of registration for electric meters should not be in excess of 4 per cent at light load, half load or full load, has been altered to read between one-tenth and full load. Instead of testing and adjusting each meter accuracy at the time of its installation, the revised rule stipulates that each watt-hour meter shall be checked for correct connection, mechanical conditions, suitable location and registration in its permanent place within thirty days after installation. Meters operating at low power-factor are to be tested at approximately the minimum power-factor at which they will be required to operate and meters installed with instrument transformers or shunts are to be tested jointly with the transformers or shunts; otherwise the ratio of transformation of the transformers or calibration of the shunts must be determined at least once every five years. The rule requiring that each electric meter must be tested at least once every year has been abandoned and the following schedule of periodic tests substituted:

Single-phase, induction-type meters having current capacities not exceeding 50 amperes shall be tested at least once every two years and as much oftener as the results obtained shall warrant.

All single-phase induction-type meters having current capacities exceeding 50 amperes and all polyphase and commutator-type meters having voltage ratings not exceeding 250 volts and current capacities not exceeding 50 amperes shall be tested at least once every year.

All other watt-hour meters shall be tested at least once every six months.

In no case shall commutator-type meters having heavy moving elements and sapphire jewels be allowed to make more than 1,000,000 revolutions between tests. Where meters are found to register considerably in error when tested on the above schedule, the Commission reserves the right to order the particular meter or class of meters tested more frequently. The fees for the referee tests made by the Commission in cases where the consumer is not satisfied with the complaint test made by the utility, has been changed so as to range from $2.00 for small meters to $8.00 for large ones, these fees to be refunded to the consumer by the utility in the event that the meter is found to be fast beyond the four-per-cent limit.

A new rule has been added which requires each utility furnishing electric service to keep a record of the time of starting and shutting down power-station equipment and feeders, with the indication of the principal switchboard instruments at sufficient frequent intervals to show the characteristics of the load. A record must be kept of all interruptions of service during which the voltage on the system remains below 80 per cent of the standard for more than thirty seconds and include in such record the time, duration and cause of such interruption.

In as much as the question of maximum demand is assuming considerable importance in the determination of rates for electric service, the matter of maximum-demand meters was carefully studied in the formulation of the revised standards. It was felt, however, that the development of meters and instruments for determining maximum demand was in such a state at the present time that it would be inadvisable to lay down definite rules for the determining of maximum demand and the testing of maximum-demand apparatus.

The new standards of service involve a total of twenty-seven rules, an increase of two over the old, and the main points of difference between the two sets have been noted above.

Low Water in Vermont.

Owing to low water in the Connecticut River, due to the excessive drought of the present summer, the Connecticut River Power Company is obliged to economize the output of electrical energy generated at its Vernon, Vt., hydroelectric station. The Gardner Electric Light Company, which obtains its current from the Connecticut River Company, started its auxiliary steam plant at Crystal Lake on August 18. Superintendent J. D. Whittemore, of the Garden Company, stated that the local lighting and power service will not be obliged to depend entirely on the steam plant, though that could generate sufficient energy to meet local demands if necessary.

The Vernon plant, through the Connecticut River Transmission Company, supplies electricity to many towns and cities in central New England. It is not expected that there will be any serious inconvenience from the present low water.

The National Telegraph Department has recently been installing storage batteries in the principal telegraph offices in Argentina, and this system is to be adopted in all the more important offices located where there are electric light plants; 50,000 primary batteries have already been removed, and it is probable that 16,000 more will be replaced by storage batteries during the current year.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 158.—Negative Booster.—What is meant by a negative booster for an electric street railway? Does it lower the voltage when the load is light?—T. N. W., South Bend, Ind.

No. 160.—Time-Limit Relay.—Is there any advantage in using a time-limit relay in connection with an oil circuit-breaker in a case where overloads are a frequent occurrence and are of such a nature that it is necessary to open the line? In the case I have in mind, short-circuits are frequent and unavoidable.—W. E. N., Colorado Springs, Colo.

No. 161.—Wireless Receiver.—In a radiotelegraphic receiving apparatus, is there any kind of a protective device that will prevent unusual currents, such as are sometimes due to extraneous disturbances, from traversing the receiver?—J. M., Bayonne, N. J.

No. 162.—Electroplating Lead and Brass.—Is there any good method for electroplating lead or brass on copper and iron? I should like a formula for the solutions used.—R. H. P., Philadelphia, Pa.

Answers.

No. 155.—Prevention of Corona Loss.—In steadily increasing the voltage of long-distance transmission lines, what precautions are taken to prevent or minimize the loss from corona?—E. T. H., Phenix, Ariz.

Corona losses can be prevented to some extent by the avoidance of angles and points in the wiring. The wires should turn no sharp corners; busbars should be cylindrical; and joints should always be smoothed off just as much as possible. The two lines of the circuit should not be too near each other, either. Even dust has an influence on corona losses, and as a rule after a line has been in use a few hours the loss will drop, simply because of the greater smoothness of the wire due to electrification and driving off the dust particles.—D. M. L., Elizabeth, N. J.

The air breaks down at a lower volt-

age the greater the curvature of the surface of the conductor; hence the critical voltage is higher the larger the size of the wire used. Therefore aluminum has an advantage over copper when this critical value is approached, as it has a greater cross-section for the same resistance. Since the object of adopting high voltage is to limit the amount of metal used in the conductor, it is not economical to use solid conductor of large diameter; but a large diameter may be secured without equivalent increase of metal by winding the strands of wire around a hemp core. Wider spacing between the three conductors carrying the different phases also helps to increase the critical voltage. Of course sharp bends in the conductor should be avoided.—G. M., Maywood, Ill.

No. 157.—Forming Storage-Battery Plates.—In electrochemically forming storage-battery plates directly from the lead, what acid is the best to use? Has the use of nitric acid for this purpose been so perfected as to make its employment safe? Is reversal of the plates after first forming them always necessary?—F. B. E., Chicago, Ill.

In forming storage-battery plates direct from lead, it is best to use pure sulphuric acid of 1,050 to 1,150 specific gravity. All plates should be formed as positives against dummy negatives, and those intended to be used as negatives, reversed from the positives. The use of nitric acid is not safe and will not give results which are so uniform as will the pure acid bath. A forming solution may be made from sulphuric acid and sodium nitrite or potassium nitrite, sodium nitrite being preferable. This will give quick formation, but is extremely difficult to manage. It would be better to seal off any positives formed in the bath in a bath of pure sulphuric acid later, after which sealing off, they should be thoroughly washed, when they would be ready for use. There have been several patented forming solutions printed in electrochemical magazines during the last four or five years. The forming current should be strong enough to maintain a vigorous gassing at the positives throughout the formation. The efficiency will be as low as five or ten per cent. A quick formation will give a darker and perhaps more desirable positive. It is, however, a more costly formation than a slower one.—R. L. L., Minneapolis, Minn.

No. 159.—Electric Vehicle Formulas.—Have any formulas been developed for determining the size of motor (horsepower rating) required for an electric vehicle, also the size of lead storage battery (ampere-hour capacity), when the approximate dead weight and live load of the vehicle, the maximum running speed and street grade are known and the car is to be used in a city with well paved streets?—C. H., Albany, N. Y.

The determination of the horsepower required for an electric vehicle motor may be made only approximately, due to the variation in the power required for different street surfaces.

The motors used for this work are designed to operate under heavy overloads. It is therefore satisfactory to calculate the horsepower required under the average conditions. Any grades or poor stretches of road are usually short and the extra power required is easily taken care of by the overload capacity of the motor. The following formula will give good results provided fair values are taken for the tractive effort.

Horsepower $= 0.0033\ W\ T\ V$ in which

$W =$ total weight, vehicle and load, in tons.

$T =$ tractive effort in pounds per ton, as applied at the rear wheels.

$V =$ speed in miles per hour.

T may be taken from 20 to 30 on level asphalt or macadam. After the horsepower of the motor is calculated a standard voltage should be assumed. The current taken may then be easily found, and a suitable battery selected.—R. E. P., Brooklyn, N. Y.

No modern formula has been developed for determining the horsepower of motor necessary, or even the kilowatt-hour capacity of the storage batteries necessary, to run any trackless vehicle at given speeds with given tires and loads for the reason that the problem is an extremely complex one. Mechanics or engineering has no formula for the rolling friction of rubber tires, and coupled with this, you have the effect of the different pavements and roads, not to mention the different efficiencies in the different transmission systems. There is a formula which was developed some time ago which can be used for somewhere near the amount of power required. This formula is:[1]

$$\text{Horsepower} = W\ S\ F\ /\ 375$$

where W = weight in tons, S = speed in miles per hour, and F = friction resistance in pounds per ton. Friction resistance increases with the speed. F is taken as 17.3 at a speed of 5 miles per hour up to 39.3 at 19 miles per hour. This is a modification of the traction (track) formula.

This formula can be used for approximate calculations but should, however, be verified and modified in order to suit your own particular conditions. A great deal can be learned from tests on existing electric automobiles. A few years ago, it was customary to build an electric automobile and reserve a certain space, and the storage-battery company was then told to go ahead and put a certain battery in that space, and that battery was supposed to be sufficient to run the automobile at a moderate rate of speed. No calculations of any kind, however, were theoretically made previous to the installation of the battery.

1 F. B. Rae, *Western Electrician*, Vol. 54, No. 10.

The voltage of the battery should be such as could be most economically charged from either a 110-volt or a 220-volt direct-current line (40 or 80 cells). The ampere capacity of the battery would depend upon the currents which the battery would be called upon to supply. This would be governed by the distances the vehicle would be supposed to make on a charge, and the energy which it took to run it at the average rate of speed. The average electric automobile has a motor varying between 2 and 3 horsepower in size, with 300 per cent overhead capabilities, and it is usually undermotored. It is usually equipped with a battery varying in capacity from 9 to 18 kilowatt-hours. The voltages are very far from standard.

There is considerable room for improvement in the electric automobile, and this improvement can be made with the materials at hand if the subject is given a little good engineering thought.—R. L. L., Minneapolis, Minn.

"Safety First" Policy Reduces Accidents.

A "safety first" conference was held in New Albany, Ind., August 22, at which officers of the Middle West Utilities Company of Chicago and the Interstate Public Utilities Company, of Indianapolis, spoke to trainmen of the Louisville & Southern Indiana Traction Company, the Louisville & Northern Railway & Lighting Company, the United Gas & Efectric Company, of New Albany, and others.

The phenomenal activity and work of the bureau of safety of the Middle West Utilities Company, of which Charles B. Scott is manager, is declared to have reduced the number of accidents in properties which the company operates by 50 per cent. Mr. Scott spoke at the recent meeting. It is planned hereafter to have more of the time given up to the employees themselves, who will be asked to state their experiences in connection with efforts at accident prevention.

Meeting of Chicago Section, Electric Vehicle Association.

At the meeting of the Chicago Section, Electric Vehicle Association of America, held August 26, an informal discussion on tires was held. It was agreed that demountable tires had advantages in towns where no tire-applying machines were available, but in most cities side-wire tires can be applied in about the same time as demountable ones. Large tires effect a saving of about 25 per cent over small tires, after deductions have been made for the greater amount of energy necessary to propel cars equipped with larger tires. Changes in the tire specifications of the Society of Automobile Engineers must be made before the highest efficiency can be obtained.

Michigan Section National Electric Light Association Convention.

Annual Meeting Held at Ottawa Beach, August 19, 20 and 21.

Departing from the practice of the past two years of holding its annual conventions aboard ship the Michigan Section, National Electric Light Association, met on terra firma at Ottawa Beach, Mich., August 19, 20 and 21. While the meetings of the two previous years were indeed successful from every point of view, the Ottawa Beach convention was unquestionably the largest and most interesting so far held by this organization.

Seldom, if ever, has a state association been able to present to its members such a notable array of papers as those read at the Wednesday session, devoted to questions of policy, rate regulation and commission regulation. The speakers on this occasion included such notables as Hon. Lawton T. Hemans, chairman of the Michigan Railroad Commission; James V. Oxtoby, a prominent utility attorney of Detroit; Richard L. Drake, secretary of the State Industrial Accident Board; T. C. Martin, secretary of the National Electric Light Association; and William J. Norton, secretary of the N. E. L. A. Rate Research Committee.

The papers at the other sessions were also of great interest, and while discussions were necessarily limited, due to the length of the program, the second annual convention of the Michigan Section will undoubtedly result in much benefit to the members of the Association.

President F. B. Drees, of Lansing, in opening the first session of the convention on Tuesday morning referred to the meeting as the Association's tenth annual convention, although it is the second since becoming a part of the National Electric Light Association. During these 10 years there has been a decided change in the general policy of public-utility companies. The public has been taken into the confidence of the companies regarding rates, franchises, etc., and the air of mystery which previously surrounded corporations, and which was largely responsible for the frequent failures occurring, has been entirely cleared. All progressive central stations are working to establish a closer relationship between public and company, and while much good has been accomplished, the millennium has not by any means been reached.

Mr. Drees recommended that the Association consider the advisability of appointing a "Public Policy Committee," to consist of three members, whose duty it shall be to keep in touch with member companies and extend advice and assistance relative to all public-policy matters. A committee whose function it will be to collect data and information on lightning arresters and thier installation was also suggested.

A paper prepared by J. R. Cravath, of Chicago, entitled, "Indirect and Semi-Indirect Lighting" was then, in the absence of the author, read by Herbert Silvester.

The most notable tendency of the last three years in illumination practice has been the adoption of indirect and semi-indirect lighting for many of the most important lighting installations. There are those who ascribe this tendency to the inclination of many to follow passing fads and fancies. There is of course a tendency and also a constant demand for something new and different in lighting styles as in other matters. However, there are certain sound, scientific reasons for the increasing use of this class of lighting.

The three principal scientific reasons for the increasing use of indirect lighting were given by Mr. Cravath as follows: (1) The concealing of the bare lamp so as to avoid uncomfortable and injurious glare in the eyes from the lamps themselves, substituting therefor diffused illumination from a considerable area of ceiling. (2)A reduction in the annoying glare of specular reflection from papers and magazines. This being due to the fact that the source of light is spread out. (3) The elimination of sharp shadows, which are annoying in office work and are frequently unpleasant in their effects in the home or audience room. Along with this last advantage comes the absence of any necessity for portable desk or reading lamps where interiors are sufficiently lighted by indirect means.

In office lighting, the second and third advantages are predominant. In audience room and residence lighting the first and third advantages are most important.

The first question usually asked about the system by the prospective user is whether it is not more expensive than a direct lighting system, and if so how much. The answer usually is that if the conditions are suited to indirect lighting, it is the cheapest thing to install, if all items are included. To be sure the most efficient type of direct system can produce a given average illumination for about 60 per cent of the wattage of the most efficient indirect system. However, when we figure that it is human efficiency and comfort that we are after, the small saving in electricity in favor of the direct system is wiped out by its disadvantages.

Semi-indirect lighting Mr. Cravath said, is a rather indefinite term used to designate a class of lighting which has been rather extensively installed within the past two or three years as a substitute for pure indirect lighting. Strictly speaking, semi-indirect lighting should be applied to a system in which half the light is received from the ceiling and wall indirectly by diffuse reflection and the other half comes directly through the glass on the fixtures.

The measured efficiency of a semi-indirect system may be varied considerably by the shape of the bowl, its composition and interior finish. The efficiency, however, will usually fall between that of the direct and indirect systems, although with some kinds of glass and with inefficient bowl shapes, the efficiency may fall as low as with a pure indirect system. It has been found by tests and practical experience that when more than 15 per cent of the light received on a book or paper comes directly from the bowl of a semi-indirect lighting unit that the shadows begin to become annoying and the annoyance increases the greater the percentage of direct light received. It must also be evident that the annoyance from the brilliancy of the light source must increase the greater the percentage of the direct light. One of the reasons for the popularity of semi-indirect lighting has been its pleasing appearance. Many people prefer to see some distinct source of light in addition to the illuminated ceiling. However, all of the aesthetic advantages and the pleasing appearance of semi-indirect lighting can be obtained together with the advantages of the indirect by conforming to certain specifications. The first of these is that 85 per cent or more of the light should be received by diffuse reflection or indirectly. If this is applied with the surface brightness of the illuminated bowl of the fixtures, it will not be enough greater than the surface brightness of the ceiling to cause either annoying sharp shadows or annoying glare from the bowl.

Mr. Cravath said that we have come to the point in illumination practice where satisfactory results, rather than cost of operation, should govern. The difference in cost between satisfactory and unsatisfactory results is so small that where electricity is as cheap as it is at present, there is no excuse for anything but good results. It is no longer wise to provide illumination

which is barely sufficient for the purposes for which it is used. The illumination should be ample and comfortable. In this connection, engineers and others who do not look at the matter in a broad way are frequently inclined to compare systems of illumination on the basis of the cost to produce equal illumination intensity on the working plane. Now, if all system of lighting would give equal satisfaction with equal illumination on the plane of work, such comparisons could be made. As a matter of fact, it is impossible with some systems of lighting to produce as satisfactory illumination as with others,—no matter what intensity may be used. One frequently hears it stated that lower intensity of illumination will be more satisfactory with indirect lighting than with direct lighting. It is probably true that in some cases indirect lighting has displaced direct lighting of a higher intensity in foot candles. This does not to my mind prove that one can get along with a lower intensity of illumination with one system than with the other. It rather proves that one of the systems was less satisfactory than the other with any ordinary intensity. If any system of lighting is unsatisfactory, the majority of people will complain there is not light enough without regard to the real cause of the trouble. For this reason, higher intensities than are at all necessary may be used with unsatisfactory systems of illumination, and when a more comfortable system is substituted less illumination is required. This is what has actually happened in some cases and has given rise to the erroneous practice of trying to compare systems of lighting on the basis of illumination required to give equal satisfaction when there is really no such thing as equal satisfaction with the two systems.

Before taking up the next paper President Drees introduced Eugene Holcomb, president of the Minnesota Electrical Association, who has recently become general manager of the Continental Utilities Company, of Lansing. Mr. Holcomb said he hoped to become a member of the Michigan Section and engage in its activities.

A paper entitled, "The American Kicker" was then presented by D. B. South, of the Edison Illuminating Company, Detroit. This paper deals interestingly with the methods in vogue to hold existing business, with special reference to the practice of the Detroit company in handling complaints.

When a customer calls at the company's office, writes a letter, telephones or files a complaint in any other way and the ordinary analysis of the account does not satisfy him that the same is correct as rendered, the following procedure is followed, whether it is a $250.00 steam or a 76 cent electric light bill. His meter is tested and a careful investigation and examination of his account is made at the expense of the company. Such tests are usually made in the customer's presence, and appointments during regular business hours are made.

A card record, which is very satisfactory, is made for each case and held in file upon completion of the report. It is a comparatively easy matter to compile complete data from the card index. The card shows name, address, classification of account, base rate, connected load, maximum demand, etc.

Orders in duplicate are issued to the meter testing department to test the meter, check the load, the demand indicators, or make such special investigation as the nature of the complaint requires. Intelligent co-operation on the part of the testing bureau is very essential, and the Detroit company is particularly blessed in this respect, receiving most comprehensive reports from this department.

The meter testing department secures the information and returns report to the office and it is put through the following analysis. The bill is checked as rendered for clerical error in computation. The meter number is checked to see if the proper meter has been tested and if correctly charged to the customer. The meter reading at the date of the test is checked to prove or disprove the reading to which the customer has been billed. The demand-indicator readings are checked to see if the customer has been overbilled in his base rate. The load is checked against the indicator readings to see if the load as recorded is correct. The meter accuracy is noted and if 4 per cent or more in excess of perfect, a refund is made on electric bills to reimburse the customer for any overcharge because of inaccurate meter. On steam bills the same percentage of error is allowed if the test is made upon the customer's premises.

Co-operation with your collection department is also a vital point in the conduct of these investigations, and notice of the same should be properly served at the outset, as it would be embarrassing to advise a customer to withhold payment of a freak bill until the investigation could be made, and have the collection department cut him off the next day for non-payment of the account. Statistics on complaints handled by the Detroit company were presented and also figures on the trouble caused by grounded secondaries.

H. C. Sterling, of Three Rivers, in opening the discussion said that the average customer having a complaint to register likes to have the privilege of talking to some one who has the authority to make a decision. He held, therefore, that complaints should not be received by the office girl or cashier in the office but the complaining customer should be sent directly to some employee who can personally follow up the trouble. He inquired of Mr. South how frequently meters are regulated by the Detroit company. In reply, it was stated that periodic tests are made of all meters and in cases where the customer has been overcharged, refund is made.

E. A. Lueky, of Detroit, added that small meters are checked on an average of about once in two years. Large meters are checked more frequently, some as often as once each month.

D. B. South, of Detroit, stated that one of the most important phases of the question is what to do about customers who do not complain. He believes that central stations in the future will maintain a field organization to call periodically on customers, to learn whether they are receiving satisfactory service and to adjust minor complaints. The publication by central stations of their rate schedules has, he thought, stimulated good will between company and customer.

H. A. Fee, of Adrian, spoke of a scheme which the Adrian Company has for keeping in close touch with existing customers. A so-called inspector devotes his entire time to calling on customers, making minor repairs on household appliances, renewing parts, etc. An electric vehicle is used in this service and a supply of domestic appliances and small motors is carried and direct sales often result.

President Drees said that a great deal of missionary work can be done by the meter reader and that central stations should exercise considerable judgment in selecting employees for this service.

R. W. Hemphill, Jr., of Ann Arbor, said that five or ten per cent of the central-station's customers who are classed as kickers are usually the most aggressive and if won over to the central-station side would be as aggressive in boosting the company's interests as in complaining.

E. A. Lueky, of Detroit, added that companies should be liberal in their policy with meter readers, placing with them authority to adjust minor complaints and otherwise tend to create harmonious relations between customer and company.

S. A. Orth, of Detroit, cited an incident where a hotel complaining of its high lighting bill was convinced of the reasonableness of the company's bill by the meter reader, who found several lamps burning unaware to the hotel management.

Mr. Fee, supplementing his previous remarks, said that the company in Adrian offered prizes for suggestions as to how

the company could better its inspection service. He said that the complimentary replies received indicated that the customers greatly appreciated the personal visits made by the inspector.

The paper by C. J. Litscher, of Grand Rapids, entitled "The Relation of the Central Station to the Electric Contractor," was then presented by the author. The information in this paper, Mr. Litscher explained, was taken largely from a paper by G. R. Jones, of Chicago, presented before a recent meeting of the Electrical Supply Jobbers' Association and published elsewhere in this issue.

There being no discussion, the paper by Thomas Chandler, of Sault Ste. Marie, entitled "The Chain," was then presented.

This paper deals with the relationship between the various departments of a central-station company which form the chain which connects the company with the customer. Some interesting suggestions relative to the conduction of these departments are made and will be treated at some length in a subsequent issue.

Herbert Silvester opened the discussion by pointing out that while additional bookkeeping is required to advise customers that the company was unable to read their meters on a certain date, the expense and effort involved was worth while.

H. C. Sterling, of Three Rivers, thought that the suggestion that a stamp be placed on a bill showing that the amount covered two months' service was very desirable. His company, however, sent out a minimum bill each month, whether the meter is read or not.

H. A. Fee, of Adrian, explained that two attempts are made to read meters by his company. If unsuccessful, the meter reader than leaves an addressed postal card at the location, which is to be filled out by the customer indicating when the meter will be accessible.

D. B. South thought that the practice of sending a minimum monthly bill whether or not the meter has been read is undesirable, as a customer does not like to receive a bill knowing that the amount is subject to change.

R. W. Hemphill, of Ann Arbor, asked whether or not any companies rendered bills on postal cards. He investigated the possibilities of so rendering bills some time ago and found that such a method was in violation of the postal regulations. In reply Mr. South stated that rendering bills on postals does not conflict with the rulings of the Post office Department if back amounts are not placed on the bill. Mr. Sterling explained that the Water Department of Three Rivers is at present using the post-card system.

Eugene Holcomb, of Lansing, thought that the principal objection to post-card bills was that no advertising could be included. This monthly advertising he thought was very desirable for central stations. He advocated the use of window envelopes, which would eliminate some of the work of the billing department.

Herbert Silvester, of Detroit, favored the delivery of bills by messengers, as it has been found in Detroit that the cost of such delivery does not exceed one-half cent per bill.

At this point President Drees appointed a Nominating Committee, to report at the executive session, as follows: D. B. South, Detroit, chairman; Thomas Chandler, Sault Ste. Marie; John A. Cavanaugh, Benton Harbor.

Wednesday Morning Session.

At the opening of the session on Wednesday morning President Drees introduced T. C. Martin, secretary of the National Electric Light Association. Mr. Martin explained that it was originally planned that Frank M. Tait, past-president of the National Association, attend this meeting of the Michigan Section, but owing to the great volume of work subsequent to the recent floods in Dayton, Mr. Tait was unable to be present. Mr. Martin pointed out incidentally that it was significant that the connected load and the kilowatt-hour output of the Dayton Lighting & Power Company is now greater than before the recent disaster. In addition to rehabilitating his own plant and system, Mr. Tait offered the service of the Dayton Company to the isolated plants that were destroyed, and fully 90 per cent accepted the offer.

Referring to the affairs of the National Association, Mr. Martin called attention to the difficulties which the Association is encountering in holding such large conventions as the recent Chicago and New York meetings. Two worthy plans have been suggested to relieve this condition, and both are being seriously considered by the officers and the Executive Committee. One is the establishment of geographical associations, such as the New England and the Georgia Sections, each of which comprises five states. These group associations could hold annual conventions and eliminate the necessity for a national meeting. Another plan suggested is to have the various sections of the National Association such as technical, commercial and accounting, hold separate conventions at different times of the year.

One of the important features of Association work is the publishing of proceedings and the monthly bulletin which costs in the aggregate, approximately $50,000 per year. A considerable saving has been made by dividing the proceedings into sections and giving each member the one he desires particularly. Greater effort is being expended to increase the value of the bulletin to members.

In conclusion, Mr. Martin stated that the National Electric Light Association stands on the principal of private ownership of public utilities and is against municipal and government ownership. While standing for private ownership the Association strongly favors public regulation and is endeavoring in every possible manner to bring about more harmony between the various state commissions and member companies. Through the efforts of these commissions, Mr. Martin said the people are gaining a better understanding of public utilities.

The paper by William J. Norton, secretary of the Rate Research Committee, entitled "Two Epochs of Rate Regulation" was then presented by the author. This paper appeared in our last issue. Following Mr. Norton, Fred L. Dennis, a member of the Michigan Committee on Uniform Accounting, was called upon for a few remarks.

Mr. Dennis explained that the committee of which he is a member was created by the Michigan Railroad Commission for the purpose of establishing uniform accounting systems for central stations of the state. He paid a tribute to the work which has been done by the Accounting Section of the National Electric Light Association and said that the Michigan Committee has simply modified these accounts so as to conform with the regulations of the Commission. The "general" accounts and "revenue" accounts conform in every respect with the N. E. L. A. system but "operating expenses" have been further divided into the following classifications: (1) Production; (2) Purchased Power; (3) Transmission and Distribution; (4) Utilization; (5) Commercial; and (6) Miscellaneous and General. Mr. Dennis said that the aim of the Committee is to prepare a system of accounting that will make relative comparisons between companies of all sizes possible.

"Public Utilities As Affected by the New Michigan Constitution" was the subject of a very interesting address delivered by James V. Oxtoby, counsel for the Edison Illuminating Company, Detroit. The new Michigan constitution which was adopted January 1, 1909, contains two features of great importance to public utilities, namely (1) The provisions with reference to franchises; and (2) Home rule of cities and villages. With regard to the former, franchises must now be granted directly by the municipalities, whereas formerly this authority was vested in the state legislature. A provision in the new constitution also states that franchises shall be limited to a term of 30 years; but whether this means all franchises issued shall terminate in 30 years or simply that "term" franchises shall be limited to a period of 30 years, Mr. Oxtoby said is still undecided. Unless approved by popular referendum all fran-

chises are revokable. Limiting franchises to 30 years is a backward step, according to the speaker. The original idea of a limited-term franchise was to permit the readjustment of rates, etc., when the time came for renewal but since regulation by Public Service Commission has come into effect the main excuse for a limited-term franchise is eliminated. Mr. Oxtoby strongly favored the indeterminate permit, or "day-to-day" franchise which protects the utilities against competition and continues until the municipality can take over the utility at a fair valuation of the property.

The effect upon franchises of the newer constitutional provisions regarding home rule were then considered, as well as the effect of these upon the rights of the state itself to regulate a utility. The most important question in this connection is whether the state, as represented by its Public Service Commission, would have any jurisdiction over local utility companies if the municipal charter should cover the subject of franchises and put control in a local body. Whether or not it is possible in such cases to make control entirely independent of the state commission must be decided by the courts.

Following Mr. Oxtoby, Lawton T. Hemans, chairman of the Michigan Railroad Commission, spoke briefly regarding the co-operation that the Commission desires from the utility companies. The remarkable advances that have been made during the past 20 years in telephone, telegraph, lighting and power service has caused a lack of proper adjustment between company and public that has made necessary the establishment of regulating commissions. It is the aim of the Michigan Commission to make the necessary adjustments by conference rather than by order, and to this end the co-operation and help of public-service companies is desired. In commenting on commission regulation from the standpoint of a commissioner, Mr. Hemans said that public opinion is one of the important items that must always be considered by the Commission. He also referred to the volume of work handled each term and the necessity for patience on the part of the utility companies.

Thursday Session.

Before taking up the regular program of papers on Thursday morning, President Drees introduced Prof. A. R. Sawyer, of the Michigan State Agricultural College, who spoke briefly concerning the efforts of the college to bring the farmer and the electrical man into closer touch. In the future, Professor Sawyer said, farming will be largely dependent on engineering.

H. C. Stirling, vice-president of the Association was then called to the chair and introduced Richard L. Drake, secretary of the State Industrial Accident Board who spoke on "The Importance of Accident Prevention in the Administration of a Compensation Law." Since the going into effect of the Employee's Compensation Law, the number of accidents in the state have been materially lessened. Previous to the enforcement of the law there occurred daily one fatal and 100 non-fatal accidents in the state, while during the past 11 months the fatal accidents have averaged 1.5 and the non-fatal 65 per day. Statistics presented by Mr. Drake showed that during the 11 months that the Compensation Law has been in effect, 16,587 accidents have been reported. Of this number 375 were fatal; 2,000 were so serious that amputation of the injured member was necessary; and 10,063 came within the compensation law, the victims being incapacitated for 14 days or longer. While the cost of these accidents to the companies is great the employee stands his share as only one-half salary is received during period of disability.

Mr. Drake pointed out that the function of the Accident Board is to arbitrate and settle cases where differences exist and it is not necessary for an employee or his family to engage an attorney. Numerous incidents where exorbitant attorneys fees were demanded were cited.

In conclusion Mr. Drake said that the board was vitally interested in the prevention of accidents and to this end asked for the co-operation of the employers. He suggested that every employer should interest his men in the necessity for exercising care and that accident-prevention committees be established in every plant. It was also suggested that the Association appoint a committee to co-operate in the prevention of accidents and act as a clearing house for experiences of companies relative to accidents and their prevention.

In reply to a question of H. A. Fee, of Adrian, as to the deficiencies of the present law, Mr. Drake added that if any changes are made they should provide for higher compensation to injured workmen, longer medical attention and less delay in receiving money after an accident.

A paper by J. A. Cavanaugh, of Benton Harbor, entitled, "High-Tension Distribution by Means of One-Wire Grounded System," was then presented.

This paper points out that single-wire transmission of electric current is one of the earliest forms of transmission and holds possibilities for securing rural business due to its low cost. The Benton Harbor Company, studying along these lines, found that the only solution would be along the line of a single-wire grounded-return primary distribution, giving single-phase current on a single wire, three-phase current on the two wires. This would give a dead ground with the entire generating and transmission system, which of course could not be tolerated. It, therefore, became necessary to devise some system that would give immunity from grounds on the one hand and allow a permanent ground on the other. This can be very nicely accomplished by a 1:1 transformer, or if rural lines are to be very long, very easily make the transformers 1:2, thus giving a 4,600-volt single-wire line from a 2,300-volt two-wire line.

About a year ago the company made arrangements to build such a line. Two commercial transformers with secondaries connected together, provided the necessary insulation between the rural and city lines. The single-wire lines were built under adverse conditions. This line is approximately 2.5 miles long. Triple-braided weather-proof wire has been used throughout the system both for primary and secondaries. The secondaries are not grounded in this system, in fact all efforts possible were made to prevent the grounding. Lightning arresters are placed on the line at every transformer. Transformers are fused between the transformer and ground and between the primary wire and ground, in fact the secondaries and transformers construction are the company's standard type of construction, the second or grounded wire of the primary side being run to No. 4 rubber-covered wire, which is nailed to the pole and covered with special wood mould going to the ground and connecting with a 24-inch copper ground cone buried in moist earth with one sack of charcoal around the cone. When first starting the company had a great deal of trouble with induction on the telephone lines. These lines were transposed on every fifth pole, using standard Michigan telephone transpositions. This helped the matter, but there was still considerable induction caused by grounds on the primary line in running through trees.

So far, the company is thoroughly satisfied and believes that on a properly constructed line on private right of way, thus getting away from heavy trees, a line can be built much cheaper than on the standard two-wire construction with less danger from high winds, sleet and other line troubles. A line of this character can be built using 25-foot 5-inch top pole on lines, or on the highway where necessary, for approximately $228.65 per mile. This same line constructed of the same material, except using two wires instead of one, would cost $380.30 per mile, a difference of $151.65 per mile.

This was followed by the paper by A. R. Cary, of Rochester, entitled, "Description of an Automatic Pumping Sta-

tion at Farmington." This paper was presented in full in our last issue.

Papers by D. W. Hayes and W. J. Fitzgerald, on "Street Lighting" and "Alternating-Current Motors and Their Application" were then presented in the order named.

The present street lighting contract between the City of Ann Arbor and the Eastern Michigan Edison Company was entered into January 1, 1911, and is for a term of five years, that being the maximum permitted under the city charter. This contract calls for the installation of 181 direct-current magnetite arc lamps also 27 tungsten lamps for use in alleys in the business district. The contract contemplated the installation of additional tungsten 75-watt lamps throughout the city where the brilliant light of an arc is not desirable or necessary. **Accordingly in** March, 1911, 132 street series tungsten lamps were installed, the various lamps being cut in series with the arc circuit most convenient. There are now in Ann Arbor 193 arc lamps and 220 tungstens. The greater proportionate increase of tungsten lamps over arc lamps is due to the fact that Ann Arbor has very few business streets, by far the greater portion being residential. All these streets are lined with shade trees and it was discovered very soon that they could not be satisfactorily illuminated by the use of widely spaced high-candlepower units. Instead it has been the practice to install the tungsten lamps and put the lamp under the trees so far as possible.

The arc lamps are supported on mast arms or span wires as the particular installation requires. No uniform height of suspension has been adhered to because of the heavily shaded streets and each lamp has been adjusted to secure the best results in that particular place.

The tungsten lamps are supported on cement poles of very simple design. The poles were manufactured by the Edison Company at very reasonable cost. There are cast in each pole bolts for the suspension of the bracket and at the top a piece of strap iron in which to fasten the small spreader arm supporting the line wires. The brackets and reflectors are purchased. The reflector is of the ordinary radial wave type and gives a very good distribution of light.

The station apparatus is installed in a specially designed room in the Edison Building and comprises six four-ampere constant-current mercury-arc rectifier outfits, each of 50 lights capacity. Each unit consists of a constant-current transformer and direct-current reactance mounted on one frame, rectifier tube tank, exciting transformer and panel board.

The power supply is at 2,300 volts three-phase and is connected through an oil switch to the three bus bars extending the length of the rack.

The arc lamps in Ann Arbor are divided into two trimming routes. These are so timed that one man can trim the lamps and attend to other work as well. Trimming consists in simply replacing the old electrode by a new one. At each trimming the draft tube or chimney in the lamp is cleaned out, the globe cleaned, the clutch rod polished and the lamp given a general inspection.

The trimmer also makes a patrol of all circuits three times each week in order to replace burned out tungstens lamps and make a general inspection of the behavior of the arcs. He carries with him an insulated stool and rubber gloves, it being an inflexible rule that any man doing repair work on live arc circuits without them automatically discharges himself. By far the greater proportion of outages on our circuits is due to electrode trouble. The real trouble is that a slag forms on the lower electrode which causes it to stick to the upper one so tightly that the weight of the electrode holder and clutch rod is not sufficient to break contract and allow an arc to be drawn.

Mr. Fitzgerald's paper deals fully with the various forms of alternating-current motors, describing their characteristics and operating features. Brief notes on belting and shafting are also embodied in the paper.

In connection with Mr. Hayes's paper, F. B. Misterky, of Detroit, referred to the street-lighting installation in Detroit. Over 4,000 luminous arc lamps are being used and with excellent results. The manufacturer guaranteed a life of 500 hours for the mercury tubes but so far, the average life has been found to be 3,500 hours, while the maximum life is 12,000 hours. The municipal plant is now trying out a new inverted luminous lamp that has the mechanism below and can be mounted on ornamented posts. 100 are at present being installed. Mr. Misterky explained that perhaps the long life of tubes is due to the constant attention they get. Old tubes are washed and baked and then give good service.

The convention then went into Executive Session at which the officers for the ensuing year were elected as follows:

President, H. C. Sterling, Three Rivers.

Vice-president, H. A. Fee, Adrian.

Secretary-treasurer, Herbert Silvester, Detroit.

The new Executive Committee will be composed of the following: Thomas Chandler, Sault Ste. Marie; R. E. Richardson, Kalamazoo; J. A. Cavanaugh, Benton Harbor; J. E. Stanton, Belding; and R. W. Hemphill, Jr., Ann Arbor.

Entertainment.

Special entertainment features were hardly necessary as amusement was furnished by the diversions common to such a summer resort as Ottawa Beach. As all business sessions were held in the mornings considerable time was available for boating, bathing, etc., and several parties of inspection were formed to visit the municipal plant at Holland.

On Wednesday evening a Rejuvenation of Sons of Jove was held and 23 candidates initiated. Henry Rosebery, statesman for Michigan and W. J. Trott, statesman at large were in charge of the affair.

New Courses at Iowa State College.

Recognition was given to the rapid growth and development of the industries in Iowa when the State Legislature at its last session provided for strong two-year trade-school engineering courses in connection with the engineering division of the Iowa State College at Ames.

These new courses will be open to any young man with a common-school education. Practical work in cement products, road making, power plants, and the application of electricity will fit students for positions in Iowa industries.

In addition to the trade-school engineering at the college, the college this year will carry instruction in industrial subjects to the apprentices and shop men of the state through strong engineering extension courses, now being organized by Prof. Kenneth G. Smith, formerly of the University of Wisconsin, in charge of industrial extension work in Milwaukee. Evening classes in shop mathematics, mechanical drawing, and shop practice, as well as fully organized part-time trade schools, will be established in the industrial centers of the state.

A locomotive and automobile testing laboratory to cost $100,000, a new gas and steam laboratory to cost $40,000, and a new chemistry building to cost $250,000, which will house the work in engineering, agricultural and industrial chemistry, are being built this year.

Night Classes for Central Station Institute.

The demand for the course in central-station practice as given by the Chicago Central Station Institute from those unable to attend the day class, has resulted in the establishment of a night class which will begin work on September 1. The course will run for a period of 18 months, classes being held on Monday, Wednesday and Friday nights of each week. F. R. Jenkins is secretary of the Institute.

CALIFORNIA CONTRACTORS MEET.

Fourth Annual Convention is Held at Santa Barbara, August 13-16.

The fourth annual convention of the California State Association of Electrical Contractors convened at the Hotel Potter, Santa Barbara, at 10:30 a. m. Wednesday, August 13.

The registration showed that there were 120 people in attendance.

President J. C. Rendler called the convention to order, and appointed a Credentials and Auditing Committee; also a committee to draw up resolutions of sympathy for Mrs. F. Neilson, who recently lost her husband, Fred Neilson, one of the leading members of the Santa Barbara local association of electrical contractors. The meeting then adjourned out of respect for Mr. Neilson.

At 2:00 p. m the ladies and visitors were put aboard a special car and taken on a sight-seeing trip to the Old Mission. After being shown through the Mission by the fathers, the party returned to the residence of Mrs. Claude Loveday, where a lawn party was held, the refreshments being ice cream and cake.

The afternoon meeting for the members was called to order promptly at 2:30 p. m. After receiving the report of the Credentials Committee, the convention immediately got down to business. The minutes of the previous meeting were approved as read.

President Rendler made his second annual report and stated that he expected the Association to make great strides during the coming year.

Secretary W. S. Hanbridge then read his report, in which it was pointed out that an extensive educational campaign had been carried on throughout the year. He gave the financial report, and notified the members that there had been an increase in membership of 25 per cent during the year.

The following other committees then reported: Segregation Committee, Jobbers' Committee, Liability Insurance Committee, State License Committee, Price Book Committee, and Director to the National Convention. All of these reports were ordered spread upon the minutes and the committees were continued. The Price Book Committee, which had been appointed to get out suggestions for the Western sheet of the National Data and Sales Book, had done its work so well and the Association was so well pleased that a vote of thanks was extended to it.

In the evening all present at the convention joined in a dance, and there was a good time which lasted until midnight.

The meeting of Thursday morning was called to order at 10:30.

The report of the Auditing Committee was received. A special committee on liability insurance was appointed.

The matter of city ordinances was then taken up and referred to the Law and Legislative Committee, which was formerly known as the State License Committee. A committee was appointed and given full power to act, to take up and discuss co-operation with the electrical supply jobber.

At 2:00 p. m. Thursday, August 14, the ladies and visitors were taken on an automobile trip through what is known as the Hope Ranch, the members coming together again at 2:30 p.m. Routine business was handled throughout the afternoon, one of the most important things being that the Association decided that in the future whenever a member has bonds written for his work these must be handled through the office of the Secretary of the Association and the commission paid into the Association treasury.

A prize of $50 was set aside for the member who obtains the greatest number of new members during the next year.

The election of officers was then gone into and the following were elected: C. V. Schneider, of Sacramento, president; Claude Loveday, of Santa Barbara, first vice-president; George Sitman, of San Francisco, second vice-president; W. S. Hanbridge, of San Francisco, re-elected secretary and treasurer; Frank Somers, of San Jose, sergeant-at-arms.

Thursday evening there was a boat ride, on which a large number of those attending the convention went and which was a very enjoyable affair.

Friday, August 15, the meeting was called to order at 10:30 a. m. This meeting being devoted to the reading of papers, A. H. Halloran gave a very interesting talk on the work that was being done by the Society for Electrical Development. Mr. Halloran had his subject well in hand, and was listened to very attentively. The next paper was by Mr. Huntington, manager of the Santa Barbara Light & Power Company, who spoke on the "Mutuality of the Central Station and the Contractor." The next paper was by C. A. Austin, chairman of the Los Angeles Chapter of Architects. In his paper Mr. Austin handled his subject without gloves, and the paper was so good that the Secretary was ordered to print it and give it all the publicity possible.

Ralph Clapp, Statesman from Southern California, then spoke on Jovianism.

P. B. Hyde, of the Edison Storage Battery Company, gave a short talk on the necessity of having fire-alarm systems installed in hotels and office buildings, and explained that in buildings where these are installed a reduced rate of insurance is given.

The final paper of the day was by J. R. Malony, who spoke to the members and visitors on the question of liability and compensation insurance. This subject was well timed, as on January 1, 1914, a very drastic compulsory insurance law will become ef-

Group at Meeting of California Contractors, Santa Barbara, Cal., August 13.

fective in the state of California.

A short session of the contractors was held after the reading of the papers, and Sacramento was chosen as the place to hold the 1914 convention; it was also decided to hold the 1915 convention in San Francisco.

Another important subject taken up was the establishment of a committee to be known as a Committee of Experts, this to be at the disposal of architects where disputes arise. The directors were instructed to establish a sample room in their respective cities, which the architects could visit to see the different appliances that go to make up good construction.

The president of the California Association then announced that the Levy Company, of San Francisco, had offered a prize of $25 for the best paper submitted at this convention, the paper to consist of a synopsis of what would be the best things to take up in the different locals during the coming year. The prize was won by C. F. Butts, of San Francisco, president of the San Francisco District Local No. 1.

During the afternoon the ladies were given an automobile trip, and in the evening the entire party sat down to the annual dinner. The table was arranged in the shape of a large **E**; in front of the toast-master a miniature Mission was placed in which was hung a small gong, which was tolled as the toast-master desired to call the attention of the diners. The table was beautifully decorated with carnations. At the upper end of the table the children of the party were seated at a special table in the center of which was a cake in which four candles burned, indicating that this was the Association's fourth birthday.

The contractors showed their appreciation of their retiring president, for the work he had done in the past two years, by presenting him with a loving cup. After the dinner dancing was indulged in until the wee hours of the morning.

Early in the morning of August 16 the entire party proceeded to Oak Park, where a ball game was played between the supply men and the contractors for the championship cup. After a very spirited contest the cup was won, for the second time, by the supply men, the score being 17 to 9.

A real Spanish barbecue was then set out for the hungry visitors, and after about two hours spent at the table, races for prizes were held; at 3:30 p. m. the Northern and Southern contractors' ball teams met to play for the Contractors' cup. Considerable interest was shown in this game, as the cup had been won by the Northern contractors last year. After a very hard game, the Southern contractors were declared victors, with a score of 5 to 1.

In the evening a Jovian rejuvenation took place, under the direction of Statesmen Pomery, Halloran, Clapp, Sanderson, Steel and Schneider. The floor work was the best seen in California, and great credit is due the team for the manner in which it was handled.

The thing that attracted most attention at this convention was the bookkeeping set just gotten out by the National Electrical Contractors' Association and secured by Secretary Hanbridge on his recent trip to Chattanooga. From early morning until late at night the book was being examined and explained, and a number of members declared their intention of securing a set at once. Too much praise cannot be given the National Committee that has gotten out this work.

Convention of Municipal Electricians.

The eighteenth annual convention of the International Association of Municipal Electricians was held at Watertown, N. Y., August 19 to 22, inclusive, and was pronounced the strongest of all the conventions that this organization has yet held. Counting members, guests and visitors, the attendance was estimated by the local press to be about 400. The sessions were presided over by John W. Kelly, Jr., of Camden, N. J., the president of the organization, with whose presidential address the first meeting began. The first of the regular papers on the program was by Price T. Patton, of the Electrical Bureau, Philadelphia. The paper was confined mainly to a description of the police signal systems now in operation in Philadelphia. In substance, some of the main points were as given below.

Improvements in Police Signaling Boxes.

In Philadelphia the old battery system of police signaling formerly in general use is being replaced by a system which involves the use of motor-generators, storage batteries, punching registers, etc. The equipment in one office consists essentially of a small motor-generator on the wall, beside which there is fastened a wooden shelf on iron brackets on which a storage battery is installed. Above the motor-generator, iron brackets attached to the wall support a slate panel-board on which are mounted double-pole single-throw fused knife switches, a 10-ohm pony relay, two automatic protectors, an impedance coil and a resistance lamp for each of the circuits. Current for the motor-generator set is taken from the same source as the lighting current. The automatic protectors protect the motor-generator in case of overload, and the pony relay is used to open the circuit from the dynamo automatically when the machine is shut down. The circuit is from one side of the dynamo through fuses and a knife switch, through coils of the pony relay, then through contact points of the relay and then to the signal circuits leaving the house. The wire on one side of the storage battery is connected to the wire from the points of the relay to the lines. The wire from the other side of the storage battery is connected to the conductor from one side of the dynamo. In operation, the motor-generator is started, then the dynamo switch is closed and the armature of the pony relay shoved toward the coils until the contact points close. This closes the circuit from the dynamo through the coils of the pony relay to the lines of the battery, and as long as that circuit remains closed the armature will hold the points together and the current will be supplied directly to the signal lines from the dynamo and also to the storage battery for charging purposes. When the batteries are fully charged the motor-generator can be closed down, and the relay will automatically disconnect it from the lines of the storage battery; the latter will automatically take up its work immediately and supply the necessary current to operate the signal lines.

Operating Fire and Police Telegraph Systems in Small and Medium-Sized Cities.

The next paper before the convention was presented by A. C. Farrand, city electrician, Ventnor City, N. J., whose subject was that stated above and the substance of whose remarks was as follows:

A poor fire-alarm system is worse than none. The less complicated a system is the better it is as a rule. The simplest system would consist of a single circuit with from 10 to 20 boxes, a gong and punching register in the fire station, a public alarm, perhaps, and sufficient source of current to operate the circuit. The next in line would be the above system duplicated with from 2 to 12 circuits operated by an automatic repeater. Next would come the semi-manual office, where an alarm turned in on one circuit goes directly through to the fire stations and an alarm coming in on any other circuit is received on a register and sent out on a manual transmitter after the first has gone through the repeater. The most complicated of all the systems is the one having a manual office, with its box, joker and gong circuits, receiving registers and transmitting apparatus, keyboards, relay boards and complicated switchboards. This system is much slower than any of the other three, as the first round of an incoming box has to be received by the operator before it can be sent to the fire stations. It is made still slower in some cities where they have no registering apparatus in the fire stations by the operator sending in 10 taps over the joker circuit to let the fireman on watch know a fire alarm is about to be turned in. In some cities having a system like this the police offices are under orders to pull a box two or three times when turning in an alarm of fire in order to make sure that the operator will get at least one round of the alarm correctly. This fault, however, is largely due to having too many boxes on a circuit, with all of them of the interfering type. A good 20-ohm telephone receiver is one of the most useful appliances for testing a fire-alarm box. The terminals of the leads to it should consist of a pair of good substantial snap connectors. When connection is made across the binding

posts of a box there will be a slight click in the receiver showing that the resistance of the box has been cut out and the receiver and its connections are in good shape; when the box is pulled the click in the receiver will be much sharper as the code wheel opens the alarm circuit. The telephone receiver can also be used to make tests for any irregularity caused by dirty or corroded code wheels, poor contacts, and the like. The practice of testing an alarm box by sending in an alarm is not to be recommended; for it is criminal to have a fire-alarm circuit open for even one second when this can be avoided. In making mechanical tests or repairs to fire boxes where they have to be plugged out it is a good thing for the lineman to carry a set of plugs in his pocket consisting of one or more attached to each end of a piece of fish line six or eight inches long; thus the liability of his leaving a box plugged out is greatly reduced. It is also good practice for him to carry an extra inner shell with a break wheel having a different number from the ones in regular use, for if a box has to be carried to the shop for repairs this can be slipped in its place without disabling the system. The repeater comes next in importance to the street box. Most of the troubles with this are purely mechanical. One of the best is to have all gongs, bells, etc., on circuits separated from the box circuits and have them work from the barrels of the repeater. Then, if possible, a different box circuit should run to each fire station. The gong should be put on the striking circuit and the indicator on the box circuit. The grounding of the shell of fire-alarm and police telegraph boxes is not to be encouraged except where all the circuits are underground. Grounding the shell only protects the party sending in an alarm where there is a cross with the box pipe. The safe thing to do is to ground the interior mechanism, and, then if there is proper insulation between this and the shell of the box, there will be little danger of persons receiving shocks.

The Allowable Potential of Overhead Wires in City Streets.

This was the subject of a short paper by Clayton W. Pike, chief of the Electrical Bureau, Philadelphia, Pa. The paper discussed the present tendency toward the use of constantly increasing voltages in transmission lines and raised the question as to what the highest voltage allowable on lines in city streets ought to be.

The various disturbances that may occur on high-potential lines were enumerated and discussed at some length one by one, especial attention being paid to the effect of high-voltage lines on neighboring telephone and signal circuits. The author also went into the question of life and fire risk from high-voltage lines in the cities and towns. Mr. Pike's paper called forth considerable discussion, a leading part in which was taken by Charles P. Steinmetz, of Schenectady.

Common-Battery Equipment for Fire Alarm Offices.

George McD. Johns, superintendent of fire and police telegraph in St. Louis, Mo., was the author of this paper. The paper was mainly a description of the new equipment of the St. Louis fire-alarm office, which was described at some length in a previous number of this journal.

Mr. Johns's paper was followed by an address by R. A. Smith, city electrician of Norfolk, Va., on the subject of moving-picture risks. William S. Boyd, of Chicago, followed with a paper on "The Electrical Wiring Standard and the Efforts Made to Maintain It."

A paper on the grounding of electrical circuits and apparatus, of which H. P. Liversidge was the author, proved one of the most interesting of the papers, and provoked a lively discussion, in which C. P. Steinmetz, W. J. Canada and others participated. The paper is printed, in a slightly abridged form, in another section of this issue.

The report of the Committee on the Grounding of Boxes was presented by Timothy C. O'Hearn, city electrician of Cambridge, Mass.; "Electricity in Municipalities" was the theme of an address by Howard Joslyn, city electrician of Seattle, Wash., while Leon Taylor, city electrician of Dallas, Tex., spoke on "Street Lighting."

Election of Officers.

At the election of officers, John W. Kelly, Jr., was re-elected president, while Clarence R. George, of Houston, Tex., and C. E. Diehl, of Harrisburg, Pa., were re-elected to the respective positions of secretary and treasurer. The other officers elected were Charles P. Steinmetz, of Schenectady, N. Y., first vice-president; Robert J. Gaskill, of Ft. Wayne, Ind., second vice-president; E. D. Fitzgerald, of Tampa, Fla., third vice-president; Howard Joslyn, of Seattle, Wash., fourth vice-president.

Convention Notes.

A particularly interesting feature of the convention proceedings was a lecture, with practical demonstrations, on the prone-pressure method of resuscitation from electric shock, D. M. Gardner, of Boston, being the lecturer. J. W. Canada, formerly of Denver, Colo., and then one of the best known men in the field of electrical inspection in the West, favored the convention with an outline of the duties of the position which the Federal Government recently created in the Bureau of Standards and appointed him to; these duties include investigations as to the special hazards of high-voltage electricity. A. M. Paddon, of Syracuse, N. Y., was the special representative of the National Fire Protection Association at the convention.

The meeting next year will be held in Cincinnati.

Exhibits and Exhibitors.

Among the manufacturers and dealers having representatives at the convention and displaying products of special interest to the electrician, were the following:

The Safety Insulated Wire & Cable Company, represented by Richard C. Smith; exhibiting samples of insulating materials, steel-taped cable for underground construction work, etc.

W. N. Matthews & Brother, St. Louis, Mo., represented by Victor L. Crawford and Charles E. Heston; exhibiting samples of the electrical construction materials for which this company is so well known.

The National Metal Molding Company, represented by C. W. Abbott, sales manager; exhibiting samples of National metal molding and a full line of fittings for this material.

National India Rubber Company, New York, represented by Avery P. Eckert; no exhibit.

The H. W. Johns-Manville Company, represented by John H. McMannus and J. R. McLain; exhibiting a line of J-M fiber conduit, elbows, bends, junction boxes, etc., for underground electrical ducts, as well as fittings for pole-line distribution; also Ebony and Transite asbestos wood; also "Noark" inclosed fuses, fuse blocks, service boxes, protector blocks, etc., the exhibit including the latest type of "Noark" 2,500-volt single-pole primary fuse box for the protection of transformers, this being a box which provides safe and permanent sectionalizing of the line and which is made up to capacities of 100 amperes.

The Leeds & Northrup Company, Philadelphia, represented by Alan S. Young; exhibiting a new dial decade testing set, a new portable testing galvanometer, the Farrand fire-alarm bridge, etc.

The D. & W. Fuse Company, represented by H. F. MacGuyer, exhibiting a line of standard inclosed fuses and iron-clad combination service switches and fuses.

The Central Electric Company, Chicago, represented by J. M. Lorenz; exhibiting a line of Maxolite lighting units, Ralco plugs and receptacles, Columbia Mazda lamps, indirect lighting domes, etc.

The National Electric Specialty Company, Toledo, O., represented by P. H. Chapman; exhibiting a complete line of "Vac-M" lightning arresters.

The Okonite Company, represented by J. Delmar Underhill; no exhibit.

The Gamewell Fire Alarm Telegraph Company, represented by A. L. Tinker and O. P. Croker; exhibiting a line of its standard fire-alarm apparatus and also samples of a new electric horn for street-crossing signals.

Petroleum Production in 1912.

The great production of petroleum in 1911, which was 220,449,391 barrels, was equaled and passed in 1912, when the total reached 222,538,604 barrels. Higher prices were the rule in 1912 except in California, and even in that state there was no material decline. The total value therefore increased markedly, reaching $164,087,342, or 22.41 per cent over 1911.

Marconi Wireless Profits and Progress.

The directors of the English Marconi Company delayed the publication of their annual report until the British Parliament had ratified the Imperial Chain contract. This ratification occurred on August 8 and on August 14 the annual statement to December, 1912, appeared, from which the following remarkable figures are taken:

	1912	1911
Gross profit	$2,686,215	$1,072,035
Net profit	2,066,475	708,585

There has been distributed by way of dividend to the preferred stockholders 17 per cent on their holdings, and to the common stockholders 20 per cent. These are precisely the same rates as for 1911, when the profit was so much less, but this conservative policy is followed so as to enable the directors to put $500,000 to a special reserve fund. The conservative policy is further shown in the carrying forward to 1913 account, of $733,630 surplus.

Notwithstanding all that has been said by way of criticism of the company, its position, its patents, its policy, its methods, its manager, etc., during the recent press and poltical controversies, the directors adopt a most confident tone in all parts of their report.

They do not consider that they are going to be any the worse off for the amendments which the Postmaster General has made in the course of his "hard bargaining." Some selections from the complete document relating to Marconi doings in different countries of the world are given below:

For a long-distance wireless telegraph service a number of the company's recent patents play an essential part, and during the last twelve months the company's scientific adviser (Guglielmo Marconi) has applied for patents for a number of important inventions and improvements for apparatus used in both transmitting and receiving stations.

Continuous Waves Versus Sparks.

Notwithstanding all that has been stated and published in recent times respecting the continuous-wave system of wireless telegraphy, experience has not yet proved that that system will be capable of conducting a long-distance wireless telegraph service as efficiently as the slightly damped spark system at present in use. Mr. Marconi has invented what the directors believe to be the simplest and most economical method of generating, transmitting, and receiving continuous waves, and he alone has been able to transmit messages across the Atlantic by a continuous-wave system, of which a satisfactory demonstration, and the only one, was given to the Advisory Committee appointed by the government. Further tests are being conducted; but considerable work and time are required before it will be possible to say with any degree of assurance that any advantage in practical working is to be obtained, either by the continuous-wave system alone or used in conjunction with the spark system. With the ability of the large staff of engineers employed by this company, together with their valuable experience, directed and assisted by Mr. Marconi, the directors are confident that the development of the wireless industry will continue to be pioneered by this company. The high-power station which is being constructed in Carnarvon, and which will be worked by the company to conduct a direct service with New York, it is anticipated will be completed and opened for service during the present year. It is being supplied with both the spark and continuous-wave systems, which alone will prove from actual experience the comparative merits of the slightly damped wave and the continuous wave in all weathers, under all conditions, every day, week, and month of the year.

The Marconi Wireless Telegraph Company of Canada.

Under their contract with the Canadian Government for the operation of wireless telegraph stations on the Great Lakes, four stations have been established and placed in operation during the past year. One station is at present being enlarged, and three other stations are to be built during the current year. The negotiations with the Newfoundland Government were brought to a satisfactory termination in December by the completion of a contract which will continue the company's exclusive rights in Newfoundland until the year 1926. Under agreements with the Canadian and Newfoundland Governments the company operates 32 stations in Eastern Canada and Newfoundland, and five stations on the Great Lakes. The company also carries on a public telegraph service on 44 steamers. The Canadian Government has passed a law making wireless equipment of passenger vessels compulsory, which will necessarily result in further business for the company. The company has now in hand for the Department of Railways the construction of two high-power stations at Hudson Bay and LePas, Manitoba in connection with the construction of the new Hudson Bay Railroad by the Canadian Government. Under their agreements with the Canadian and Newfoundland Governments the Canadian Company's subsidies from these Governments now exceed $100,000 per annum.

Spain.

Seven of the first group of stations in Spain and the Canary Islands are in operation. The construction of the stations of the second group has been commenced, the first of which has been completed and opened to service. During the breakdown of the cable between the Canary Islands and Spain the telegraph service was satisfactorily conducted by the Marconi stations. Arrangements are being made for this service to be opened permanently in the course of the next few weeks. Negotiations are pending for wireless telegraph services to be opened with England and with Italy. The company has obtained orders from the Spanish Government for military stations, and also secured the whole of the orders placed by the Minister of Marine during the last year for the equipment of ships of the Spanish Navy.

Argentine.

Besides the change in the capital of the company, to which reference has already been made, there has been an alteration in the directorate and management. Upon the occasion of the visit of the company's representative to Buenos Ayres last year it was found that the Government concession for the erection of a high-power station for external telegraph service was not in a satisfactory form. Subsequent negotiations, however, resulted in a new arrangement being entered into with the Government and the construction of a high-power station has now been commenced. A similar station will be erected in this country, and when completed a direct wireless telegraph service between the Argentine and Europe will be opened.

Marconi Wireless Telegraph Company of America.

This company has declared a dividend of 2 per cent for the year ended January 31, 1913, a satisfactory result, having regard to the fact that the contract with the United Wireless Telegraph Company did not come into force until the month of July of last year, and called for considerable negotiation with shipowners and others to bring about more satisfactory terms upon which the work was in future to be conducted. The full benefit of these improved working conditions was therefore only enjoyed for a comparatively short period of the year. It will also be borne in mind that the increase of capital to the extent of $7,000,000 was for the purpose of providing a network of long-distance telegraph stations and the creation of telegraph services. Time is necessarily required to construct these stations, but this work has proceeded with all possible expedition. It is contemplated that before the end of this year a rapid and reliable telegraph service will be opened between England and New York. Arrangements will be made to open collecting stations in the City of London and in each of the principal towns in England and Scotland. Similar arrangements have been made in the United States. It is expected that a substantial revenue will accrue from this source. Stations are in course of construction at San Francisco and the Hawaiian Islands, which are approach-

ing completion. It is hoped that before the end of the year there will be a wireless telegraph service in operation between the United States and Japan, which will then be extended to the Philippine Islands and China. The contract with the Norwegian Government having been ratified by the Norwegian Storthing, a further transatlantic station will be erected immediately to conduct a telegraph service direct with the North of Europe. Under the terms of the agreement the Norwegian Government will send all telegrams handed in at the telegraph offices for the United States by wireless unless specially routed otherwise by the sender. The company and the Norwegian Government will pool the receipts of their respective stations, which should add a substantial source of revenue to the American company. Important negotiations are in progress with South American states, which should result in the construction of additional stations in the United States in the early future, and open up direct wireless telegraph service between North and South America. At all of the stations under construction the new duplex system is being installed, which will provide for a service to be conducted in both directions at the same time. Automatic sending and receiving apparatus is also being supplied, which will enable messages to be transmitted in each direction, and this rate of working is likely to be exceeded.

Chicago Smoke and Electrification.

An address was made on August 20 before the Ways and Means Committee of the Chicago Association of Commerce by W. F. M. Goss, chief engineer of the Association Committee on Smoke Abatement and Electrification of Railway Terminals. After pointing out the magnitude of the smoke problem in Chicago, where 21,500,000 tons of coal are consumed annually, Dr. Goss said:

"The committee has selected a thousand smoke stacks as typical of those used in the various classes of service in the city, and has made long and careful observations concerning the visibility of smoke emitted from them. It has determined the amount of solid matter in the gases discharged by those stacks in the form of soot, cinders, ash and fuel dust. Its work has proven that very many stacks which show no visible smoke, and which when tested by the Ringelmann method show perfect performance, are nevertheless productive sources of ash and cinder dust; such dust is normally invisible.

"The committee has made an elaborate study of the smoke discharges from locomotives operating on many different tracks of the city. By the use of the Ringelmann method it has determined the density of smoke emitted by such locomotives. By the use of sampling apparatus of original design attached to the locomotive itself, it has intercepted the solid material which is normally discharged from locomotive stacks, and determined the amount of such material. By means of metallic pans set in a line at right angles to selected stretches of railroad track, it has collected cinders and dust particles as they have fallen from the atmosphere, and by so doing it has defined the distances traveled by solid matter discharged from the stacks of locomotives.

"At great expense, also, the committee has made tests of the various grades of fuel used in locomotive service in Chicago, for the purpose of determining the amount of solid matter passing out of the stack, when each of the several grades are burned.

"With equal care it has studied the discharges of visible smoke and solid matter from the stacks of steam vessels in the river and harbors of Chicago; from the stacks of gas plants, of metallurgical and other manufacturing industries, and from the chimneys serving domestic fires.

"From its knowledge of the quantities of coal used in various classes of service, and of the smoke density delivered from the chimneys in each of these services, it will be possible for the committee to determine the extent to which each service contributes to the visible smoke of Chicago, and from its knowledge of the amount of solid matter in the smoke discharged from these chimneys it will be possible to determine the extent to which each service contributes dust to the atmosphere of the city.

"Incidentally also attention has been given to many other sources of atmospheric pollution.

"Paralleling this study of the sources from which the atmosphere is polluted, the committee has made an elaborate study of the atmosphere itself. It has maintained for more than a year a portable chemical laboratory which, taking its station in the loop district one day, in a park the next, in a railroad yard the next, and so on, has been making analyses of the air, and by a process of sampling by suction has collected on suitable filters samples of the dust particles at each particular point selected for test."

It is expected that that portion of the committee's report which deals with the whole subject of fuel and atmosphere pollution will be finished before the close of the present calendar year.

Electrification.

Meanwhile progress is also being made in developing the facts concerning the technical feasibility of the complete electrification of Chicago's railway terminals, and in estimating the cost of such electrification. All previous undertakings in the electrification of steam railroads have been carefully reviewed.

"Thus far little has been accomplished in equipping railway yards for electric operation. The Chicago terminals, therefore, present many new features. The enormous trackage to be dealt with (2,600 miles), and the fact that a large percentage of the total amount is in yards, has required that detailed study be directed upon many different points. Data have been secured concerning all permanent way accessories, such as bridges, buildings, signals and crossings which will be affected by any system of electrification.

"A prodigious amount of work has been done also in the office of the committee, and by railway companies in response to the committee's inquiries, in making up a record of train movements, a knowledge of which is an indispensable preliminary to electric design. The weight of traffic moved and the number of train movements over each piece of track in the city of Chicago has now been determined and classified. A study is being made which will disclose the rate of growth in the business of the terminals.

A Million Statistical Cards.

"All of this information, subdivided to an extent which will permit detailed analyses, has been transferred to statistical cards, such as are used by the United States census bureau and by the accounting departments of certain railroads. This system permits the facts on record to be analyzed merely by sorting the cards in suitable machines. The extent to which the system has been applied by the committee is suggested by the fact that the committee's record now includes considerably more than a million cards. When these records shall have been completed and summarized, as will be done in a few more weeks, it will be possible to determine the amount of power required to operate the terminals of Chicago, and the distribution of the power requirements over all the railway trackage of the city. The committee is making such designs of contact systems as are needed in the development of its estimates of cost.

"As a basis for determining rolling equipment and operating costs under electric operation, the work to be done is being classified and consideration is being given the possibility of using both electric locomotives and multiple-unit cars. Studies are to be made also of incidental difficulties likely to arise from the complete electrification of Chicago's railway terminals, such, for example, as electrolysis."

New Electrical and Mechanical Appliances

The Interborough 30,000-Kilowatt Tubo Units.

A contract lately awarded by the Interborough Rapid Transit Company, to The Westinghouse Machine Company, presents interesting features which are only to be met in power houses of great capacity, where the power units individually are large, and although the system as a whole may be subjected to heavy peaks, a given unit, if operating at all, is running at or near its most economical load because of the number of units in the station. Therefore it is plain that with machines of such capacity as 30,000 kilowatts, and having a high load-factor, as indicated in the foregoing, material capital expenditure is warranted for a relatively small gain in steam consumption. The problem in this case was to design turbines of the very highest obtainable efficiency, nearly regardless of their cost—the only claim prior to this desideratum being reliability in operation.

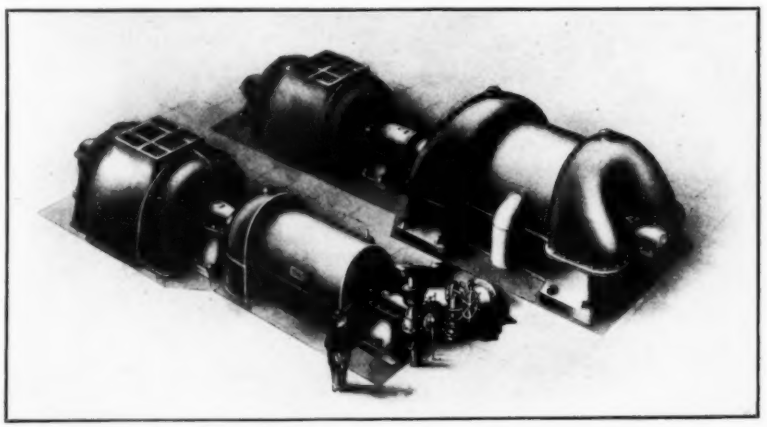
Turbines of this capacity may be designed in single units, operating at 750 revolutions per minute. Such machines would be relatively economical and would probably show a steam-consumption performance higher than has hitherto been obtained. The turbine cylinder structure, however, on account of the slow rotative speed, would be relatively large, which together with the temperature differences existing within the one structure, would involve in a machine of such large capacity, an engineering problem of some magnitude.

Similarly, both steam turbine and generator of this capacity might be designed and constructed to operate at 1,500 revolutions per minute. In this case, the structure would be less gigantic, but in order to avoid congestion of the steam in the low-pressure portions of the turbine, and to efficiently expand down to the low limits of condenser pressure—29-inch vacuum in this instance, blade speeds would be involved, rather beyond what has hitherto been considered the limit of good practice.

Either of these would be a combination-type machine, comprising an impulse element for the first expansion, followed by an appropriate number of reaction elements for the low-pressure stages, the latter being arranged double-flow. The highest degree of economy, however, is not to be obtained with an impulse element, as compared with a reaction element, providing the steam volumes, speed, etc., are appropriate for the design of the reaction turbine. In any turbine designed for high expansion ratios, the engineer is confronted with the problem of having to deal with relatively minute volumes of steam at the high-pressure end, and enormous volumes at the low-pressure end, the volume of increase being roughly on the order of a geometrical progression. It is therefore evident that if the high-pressure portions of a turbine may be operated at twice the rotative speed of the low pressure, this problem is largely eliminated. The capacities and speeds in this particular application, viz, the high pressure being a single-flow turbine operating at 1,500 revolutions per minute, and the low-pressure double-flow, operating at 750 revolutions per minute, render it possible to design reaction machines which will have an efficiency beyond anything yet heard of. The blade speeds involved are low, and either turbine element if of exceedingly simple mechanical construction, involving no engineering problems whatever, and thoroughly fulfilling the first desideratum of absolute reliability.

The scheme of employing two turbine elements, having the steam pass serially through them, is not new. A number of such units of from 1,000 to 2,000 kilowatts capacity were built by The Westinghouse Machine Company in 1901. This construction has again come to the front in the case of the English-built Parsons turbines purchased by, but not yet delivered to, the Commonwealth Edison Company, of Chicago. It is new, however, to employ high-pressure and low-pressure elements, driving separate generators, each at a different synchronous speed.

There are other advantages in dividing large turbines into two separate elements, besides those due to employing different speeds. The temperature range in either element is reduced. A sufficient number of stages may be introduced to give the very highest hydraulic efficiency without any mechanical difficulties, such as increased length between bearings, etc. Some little advantage is to be gained by separating the water, between the two turbine elements, which has been precipitated in the expansion. Either element is more reliable and simple because of its smaller size.



30,000-Kilowatt Turbogenerator for Interborough Rapid Transit Company.

Doubtless there is some slight loss of efficiency due to the employment of two generators, instead of one of twice the capacity. However, this is more than overbalanced by the gain in economy due to the two elements operating at different speeds. For want of a better term, these units have been called "cross-compound" machines.

The engineering world was somewhat startled by the steam-consumption guarantees made in the case of the Commonwealth turbine, by C. A. Parsons & Company. The guarantees of steam consumption on these machines for the Interborough Rapid Transit Company are considerably better. The pounds of steam per kilowatt-hour guaranteed in each case are approximately the same, but the operating conditions are entirely different—the superheat being 200 degrees as against 120 degrees, the latter being the contemplated

temperature at the Interborough plant. The cold waters of Lake Michigan will enable 29.2 inches vacuum to be used at the Commonwealth plant, instead of the expected 29 inches at the Interborough installation. This represents roughly a 7.5-per-cent better guarantee for the Interborough units, than for the Commonwealth installation. The steam-consumption guarantees for the Interborough Company's turbines provide for 75.75 per cent of the energy available in the expanding steam materializing as electrical energy at the terminals of the generators.

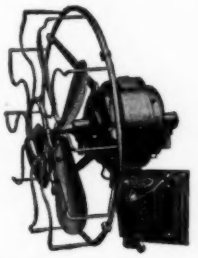
Railroad Coach Fans.

Summer is the time of the greatest amount of travel on the part of the pleasure-seeking public. Unfortunately, with the hot sun beating upon the road beds and the dust flying in the open windows, it is the most difficult season of the year for railroad companies to furnish comfort to their travelers.

The car builders and railroad companies who stop to consider why they provide an adequate heating system for their cars in the winter know there is a reason for providing electric fans in summer. The prevailing custom of car builders now is to use electric lighting in their cars. It is, therefore, a simple matter to equip their cars with electric fans.

The Westinghouse Electric & Manufacturing Company has introduced modifications of its standard fans adapting them to railroad-coach use. The drawn-steel frames—a special Westinghouse feature—are characterized by grace and strength. The quiet operation and economical use of current, and the fact that they last for years without attention except oiling once every six months, are other desirable features. The blades are so shaped that they move the maximum amount of air in the most desirable direction and at the least expenditure of energy. Lubrication is effected automatically. Grease cannot escape from the bearings.

For use on private cars, sleepers, parlor cars, diners, and day coaches, where the railroad company realizes that to make the journey comfortable is the best way of pleasing its passengers, the wall-mounting fans are used. The wall-mounting fans have inclosed end-brackets, and cast-iron bases. They are furnished in two sizes; the 9-inch size being used especially in smoking compartments and lavatories, and the 12-inch size in the main part of the car; and are wound for 24 to 30 or for 60 volts (direct current) as desired. A tooth joint with a thumb-screw adjustment positively prevents the fan from tilting while the car is in motion. The fan can be readily removed from the bracket if desired. Either single-speed or three-speed fans may be used.



Fan for Wall Mounting.

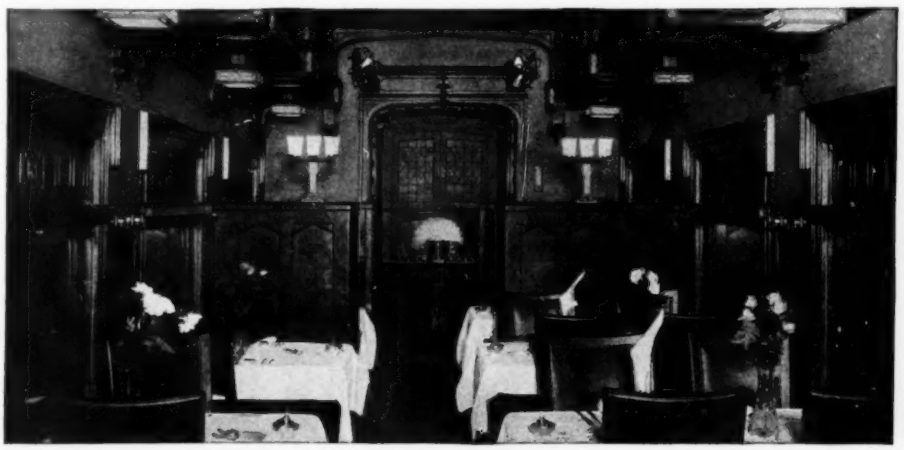
The three-speed fan has a controlling resistor inclosed in a brazed-steel casing surrounding the motor frame but separated from it enough to allow ample ventilation for the motor. Being hermetically sealed, the resistor is not subject to deterioration due to exposure to the air, and will need no repairs. It is small and so placed around the motor frame that it adds to the beauty of the fan.

The standard blades are polished and lacquered brass, and the standard guard is brass dipped in lacquer. Two styles are supplied, one without a switch and the other with a switch mounted directly on the base. Either type is supplied single or three-speed.

The wall-mounting fans are generally mounted on the sides or ends of the car, or in the smoking compartment and the lavatory. It is the usual practice to locate the control switch near the porter's cupboard, and for this reason the switch is not generally an integral part of these fans. For places where it is desired to have the control switch at the same location as the fan, these fans are supplied with a switch attached to the base.

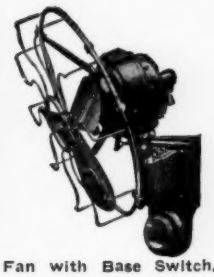
For use on electric railway cars, including subway, surface, elevated and interurban, where 500 to 600 volts is the prevailing voltage, the standard railway-coach fans, without switch, wound for 220 volts, are supplied with special resistor to take up the extra voltage. They have one lead grounded to prevent shock to any person coming in contact with the fan. The resistor also contains a choke coil to reduce the rush of current when the fan is first connected to the line. The operation of two fans in series on electric railways is not recommended, owing to the danger of burning out both fans if one of them should fail to operate.

For removing smoke, dust and odors of cooked food from the kitchens of dining cars and from buffet cars, the standard single-speed 12-inch exhaust fans are used. They are wound for 24 to 30 or for 60 volts. A speed regulator to give two additional speeds can be furnished when desired.



Dining Car Equipped with Electric Fans.

Separate Resistor.



Fan with Base Switch.

The lighthouse at Navesink on the Highlands, just south of New York harbor, is the most powerful coast light in the United States. It uses an electric arc lamp.

Improved Line of Induction Motors.

Realizing the numerous uses for induction motors, the Electric Machinery Company, Minneapolis, Minn., has placed upon the market an improved type of alternating-current motor to meet the great variety of uses that a few years ago were almost unthought of. Several special features of this motor are worthy of special mention.

The general appearance of the motor is shown in Fig. 1. These motors are made in three distinct types, as follows.

The squirrel-cage low-resistance rotor is intended for standard high efficiency continuous operation under conditions demanding large overload capacities, constant speed, and low temperature rise, such as woodworking tools, rotary pumps, etc.

The squirrel-cage high-resistance rotor is intended for special service where starting conditions are severe and where frequent starting is required, and the service is intermittent, as elevators, hoists, laundry machinery, etc.

The slip-ring phase-wound rotor is intended for variable-speed service, where starting power and wide ranges of speed control are required, such as crane service, printing presses, plunger pumps, etc.

Taking into consideration the rapid adoption of induction motors for all classes of service where direct-current motors have been used heretofore, these motors have been standardized in a great variety of sizes and speeds so that they can be applied to any machine which has previously been equipped with direct-current motors or which has been standardized for direct-current motor drive. These motors are made to meet any of the following specifications: sizes 0.25 to 500 horsepower; 1,800, 1,200, 900, 720 and 600 revolutions per minute; voltages of 110, 220, 440, 550 and 2,200 (over 20 horsepower); two or three-phase; cycles, 25, 30, 50 and 60.

Special attention is given to particular applications of these motors, such as to elevator and hoist duty, where especially high-torque starting characteristics are required. A great many conditions are perfectly met with the standard squirrel-cage type of motor with a special rotor giving it the same heavy starting characteristics as the slip-ring motor, but eliminating the extra cost of slip rings and also the attention they require. For variable-speed service, such as cranes, ventilating fans, etc., where different degrees of speed are required for continuous operation, the standard form of slip-ring motor with phase-wound rotor is provided.

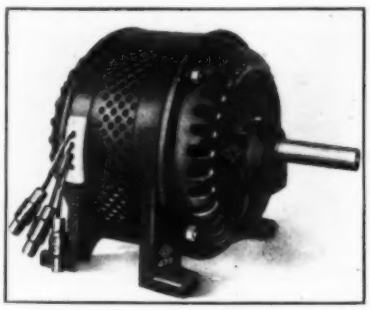


Fig. 1.—Improved Induction Motor.

These motors are made with laminated frames in the small sizes and with belt-tightener bases. The larger sizes have cast skeleton frames with sliding rails. All these motors are very liberal in design, having large bearings and large shafts with extra long extension to accommodate the various pulleys demanded by all sorts of applications. The bearing brackets are so shaped as to guard the windings effectively against foreign materials getting into them by accident, yet, at the same time they are all open, permitting free movement of air currents set in circulation by the rotor. The terminals are provided with protecting terminal blocks by which the lines are coupled to the motor with a screwdriver.

While not sacrificing anything in strength or ruggedness, particular attention has been given to obtain a pleasing appearance of the motor so that the motor may have this advantage added to its inherent advantages of ruggedness, low temperature rise under full load, and extremely large overload capacities for temporary conditions.

These motors are carried in stock in several of the principal cities so that delivery can easily be made from stock.

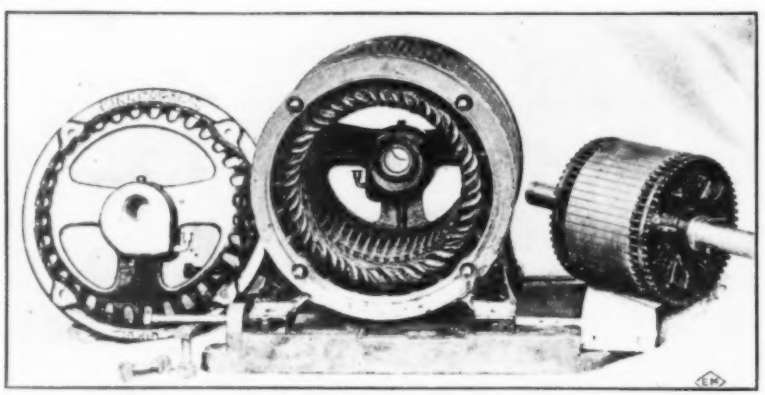


Fig. 2.—Parts of Induction Motor.

Automatic Stereopticon Device.

A. P. Roesener, 44 Randall Avenue, Bridgeport, Conn., has invented a new automatic device for shifting the slides in a stereopticon, for which patents covering 38 claims are now pending. As shown in the accompanying illustration, this device has been applied to show-window advertising. It is arranged in a cabinet two by two feet, three feet long, with a frosted-glass screen in front, above which is a shadow hood. The cabinet is constructed of metal, is handsomely painted and is fireproof. Lantern slides of any description representing advertisements or photographs may be shown, and the length of exposure regulated at will. If desired the glass screen can be removed and the picture thrown on the show window by mounting a thin sheet of tissue paper upon the latter. The machine uses lantern slides of standard size and can be built to hold any number. The slides can be easily changed, even while the machine is in operation.

Show-Window Stereopticon.

An electric lamp is used as a source of illumination and an electrical device is used to operate the mechanism, but this does not involve a motor. This mechanism takes current only when the lamp is extinguished, while the lantern slides are being shifted.

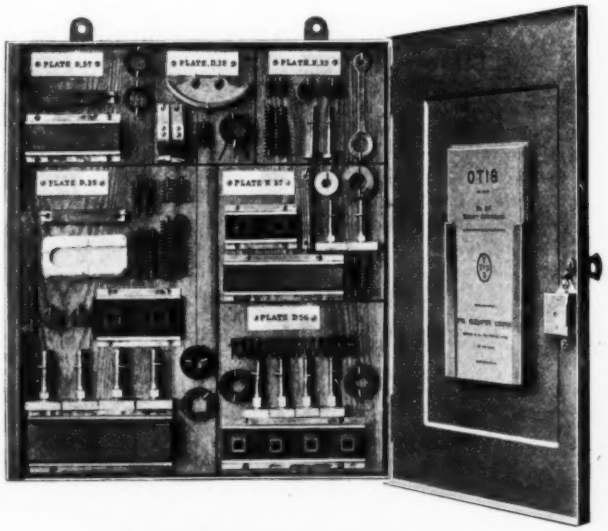
The cost of operation of this projecting lantern is said to be very low.

Otis Elevator Controller Parts Cabinet.

In order to facilitate and quicken repair service in the event of unexpected breakdowns, or worn parts on elevator controllers, there has been designed by the Otis Elevator Company, for the convenience of engineers and all who are responsible for elevator maintenance, a useful device known as the Otis Controller Parts Cabinet.

This is a compact, strongly made steel box and contains the essential parts of the type of controller furnished with the elevator machine installed. By hanging it in the engine room, the engineer may, at an instant's notice, replace a worn part of the controller, and by referring to the catalogue on the inside of the cabinet cover, order immediately a new part to replace the part removed, keeping the cabinet complete for repair work at all times.

The advantages of having one of these cabinets in the engine room are obvious. Repairs can be made immediately, elevator service will not be impaired, and there is always at hand a remedy for any controller trouble.



Cabinet for Elevator Controller Parts.

At present, these cabinets are being manufactured for direct-current controllers only, and are furnished for the following familiar types of controllers used with Otis standard drum and traction machines of all voltages—HKS, 3F, 3FA, 3FD, 6F, 6FC, 6FD, MF2, MF4, and MF4B.

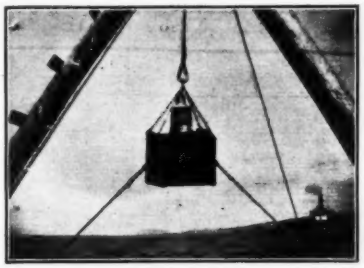
The cut illustrates the cabinet for the 3F controller.

It is stated that the price charged for these cabinets is nominal. They are manufactured exclusively by the Otis Elevator Company, Eleventh Avenue and Twenty-sixth Street, New York City.

Novel Raft Lantern.

The accompanying illustration shows a novel and interesting use for storage batteries.

In accordance with government regulations on the Columbia River, the



Lantern on Raft.

log rafts—unquestionably the largest in the world—can only be towed down the river at night on account of the interference with navigation in the day time. For the purpose of safety these rafts must be equipped with lights at both the head and end of the rafts. The electric raft lantern shown in the illustration is equipped with a storage battery and both are suspended from poles set up on the raft. This arrangement keeps the batteries at a considerable height above the raft, where there is no danger of their being washed over by heavy seas. This scheme has been used for some time and has given perfect service. The electric lamps are placed directly over a case containing the batteries, thus doing away with practically all wiring. The lantern is equipped with two 4-candlepower lamps wired in parallel and the battery consists of two 6-volt Exide cells having a capacity of 100 ampere-hours.

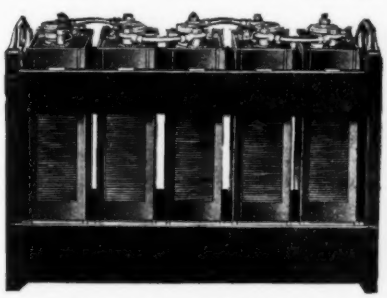
This electric raft lantern was designed by the Astoria Hardware Company, of Astoria, Ore., and the batteries were furnished by The Electric Storage Battery Company, of Philadelphia, Pa.

A New Edison Cell for Pleasure Cars and Light Delivery Wagons.

The Edison Storage Battery Company, of 105 Lakeside Avenue, Orange, N. J., has brought out a new Type A-5, nickel-iron alkaline cell. The A-5 battery has a rated capacity of 187.5 ampere-hours, intermediate between the Type A-4, 150 ampere hours, and Type A-6, 225 ampere-hours. The new battery is designed for pleasure cars, for 1,000-pound delivery wagons for industrial and baggage trucks, and for similar light work where the Type A-6 has proved to be more than sufficient.

With the Type A-5 Edison battery there is a "springiness" and feeling of power given to the control that is particularly pleasing to the operator. The Edison battery is not injured by occasional high rates of discharge, so the driver may go the limit in emergencies with no fear of evil results.

The Edison may be left on charge indefinitely and may even be put on charge in the reverse direction without harm. The container, grids, poles, etc., are all made of heavily nickel-plated steel and it is practically impossible to damage any part of the cell by falls, jars, or collisions. The Edison A-5 battery, like the other Edison vehicle batteries, carries a guarantee that it will be capable of developing its full rated capacity at the end of four years. The general terms of this guarantee require simply that evaporation of the electrolyte be replaced by distilled water to keep the plates covered, that every eight months or so the electrolyte—a solution of potassium hydrate, with a little lithium hydrate—be renewed, and that the cells be kept reasonably clean.



Five Type A-5 Edison Cells in Tray.

An American consul at Vancouver, B. C., Canada, reports that there is a good demand there for vacuum cleaners, electric flatirons and other household electrical appliances.

Novel Electric Winch.

Two English inventors (Messrs. Tyler and Freeman, of London) have designed a new type of electric winch, the chief novelty of which consists in the motor being inside the winch barrel, the whole being totally inclosed and waterproof.

The details are shown in the accompanying illustrations. Fig. 1 shows the complete winch; Fig. 2 the barrel, slip rings, brushes, etc.; Fig. 3 the internal armature and epicyclic gearing, while Fig. 4 will explain the construction more clearly. The revolving barrel on which the hoisting rope is wound forms the yoke of the direct-current motor, the pole-pieces being screwed to its internal circumference. The windings are attached to the pole-pieces and the brush carrier is also fixed to the barrel, together with a flange to which is attached a diaphragm with a gland on the armature shaft, so that oil that might leak to the windings is shut out.

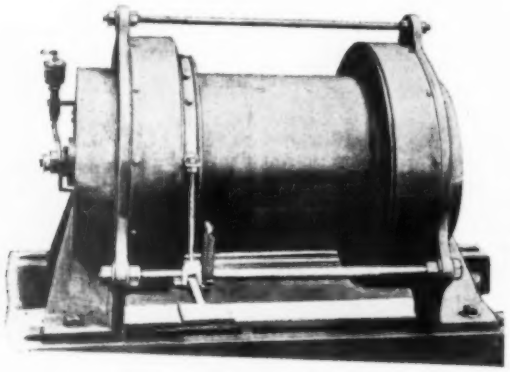


Fig. 1.—The Complete Winch.

Fig. 2.—Parts of Winch.

A point of interest in this design lies in the fact that the field magnets revolve slowly in the same direction as the armature, carrying the brushes with them. The epicyclic gearing has three pinions which engage with two inkonally toothed rings, one of which is on the revolving barrel, the other being attached to the end bearing. The barrel is mounted on ball bearings of large diameter for high-speed hoisting work, and on plain bearings for low-speed service. The armature shaft, which is likewise mounted on ball bearings, is hollow, with a central tie-rod passing through it. Four slip rings, carried on the armature end of the end bearing, enable current to be taken to the fields and armature. An ordinary controller is used for reversing. Though specially intended for ship-work, this winch is adaptable for service in other positions. It stands on a cast-iron base and is well lubricated. The winch has been made by the India Rubber Company, Limited, of Silvertown, London, Eng.

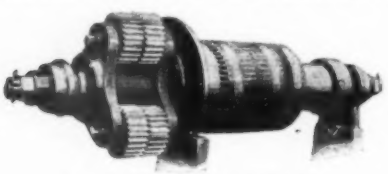


Fig. 3.—Armature and Gearing.

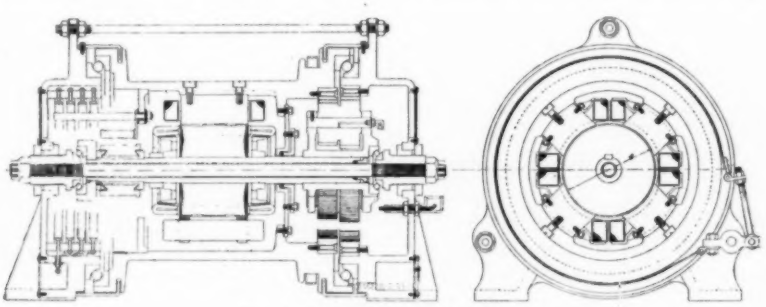


Fig. 4.—Details of Construction.

New Marconi Apparatus.

The Marconi Company exhibited in London in December the universal crystal receiver, an instrument designed to work with a crystal of the low-resistance type over a range of wave-lengths of 300 to 3,000 meters. The secondary and primary windings of the coupling inductances are each wound in three portions which are connected in series for long wave-lengths. Adjustable condensers are provided for tuning the aerial and detector circuits. The crystal is protected by a screening box and is automatically cut out of circuit when transmitting, by means of small relays in the instrument.

A striking indication of the remarkable progress that is being made in wireless telegraphy is shown by the extensive work that is now being done and that has been projected by The Marconi Wireless Telegraph Company of America.

By the latter part of October of this year the new wireless stations in New Jersey, California and Honolulu, will be completed; stations located at Belmar, N. J., and New Brunswick will communicate direct with Wales, a distance of over 3,000 miles. The stations at Marshalls and Bolinas in California will work with Honolulu, a distance of 2,087 miles, and the station in Honolulu will work with Japan, a distance of over 3,000 miles. These stations are the most extensive and powerful in this country and will be equal to the high-power stations which the Marconi Company is erecting in other parts of the world.

At the New Brunswick transmitting station there are 13 masts 400 feet high, the total length of the antenna extending over one mile. The sending aerials at the Honolulu station are to be supported by 12 steel towers, 380 feet high.

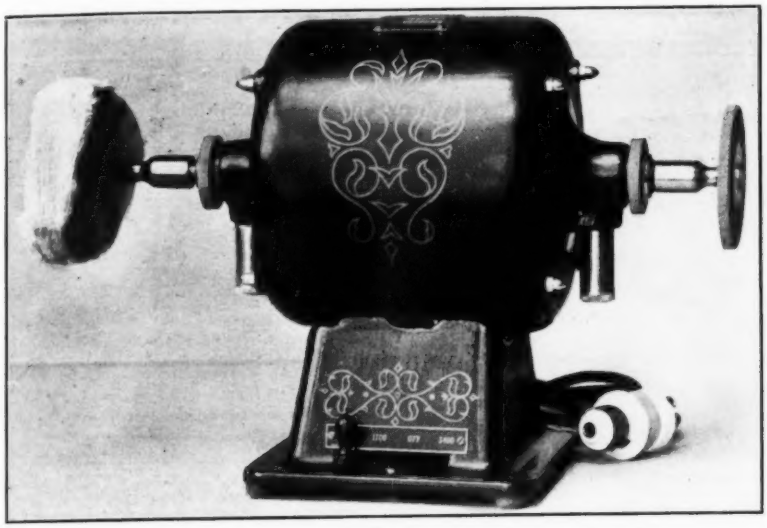
A fourth station is projected for which plans have already been made, this station to be located in New England for operation with Norway.

In connection with all three of these new wireless stations an equipment of storage batteries will be used. For this purpose 150 cells of the Chloride Accumulator, Type F-9, have been chosen, each battery having a capacity of 320 ampere-hours.

After the law was passed requiring vessels fitted with wireless telegraphy to carry an auxiliary equipment, the Marconi Company fitted 250 ships with Chloride Accumulators and Marconi auxiliary transmitters.

Westinghouse Dental Lathe.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has just placed on the market a new electric lathe designed especially for the use of dentists. It is made for operation on either direct-current or alternating-current lighting circuits and is rated at one-sixth horsepower. Alternating-current lathes have two speeds, and direct-current lathes three. Speed changes are effected by a switch lever at the base, which has also an "off" position, so that the lathe can be stopped and started at the work. The switch is built of material that is unaffected by moisture.



Westinghouse Dental Lathe.

The shaft is extended at both ends for mounting Ritter chucks which carry buffing and grinding wheels of various sizes, drills, burrs, etc. The chucks can be forced off the shaft by turning a knurled nut mounted on each bearing. A double-groove pulley is furnished with each lathe. The bearings are specially designed for grinding service; they are automatically lubricated by means of grease cups. All the working parts are inclosed and protected from dust and dirt. The finish is especially pleasing, being of glossy black Japan, ornamented in gold, with all bright metal parts nickel-plated.

New Plant of the Tungstolier Works of the General Electric Company.

The Tungstolier Works Moves to Cleveland.

The Tungstolier Works of General Electric Company, formerly located at Conneaut, O., is now located at Cleveland, O., the factory and office having been transferred August 1. The plant now occupied by the fixture works is known as the Ivanhoe Metal Works of General Electric Company and is situated on Ivanhoe Road in East Cleveland. The new plant is a magnificent structure of brick and stone, as the half-tone shows, equipped with the most modern apparatus for producing formed and cast-metal products.

The plant leaves nothing to be desired from the standpoints of equipment and conveniences for employees. Every modern device calculated to add to the comfort of the workmen and to facilitate the production of a high grade of goods is included in the equipment of this up-to-date plant. Speed machines, spinners, presses and automatic devices of many kinds have been installed. The conveniences provided for employees include a cafeteria, of the well known type maintained by the National Quality Lamp Works, a library, rest and recreation rooms and shower baths.

Under the direction of Glenn C. Webster, general manager of the Tungstolier Works, whose genius for organization is recognized throughout the industrial world, the plant is organized and systematized to operate at highest efficiency. From the designing room to the shipping room the effort of the organization is to turn out the products in the best possible manner in the quickest possible time, under the highest possible efficiency.

The headquarters of the Tungstolier sales organization are located in the downtown district, at Euclid Avenue and Nineteenth Street. Show rooms have been equipped at this address and everything which leads to complete and comprehensive service to the trade has been installed.

Celebrating the removal to their new quarters at Cleveland, the United States and Canadian sales forces of the works held their annual conference at Cleveland during the week ending August 16. Eighteen salesmen and branch managers met to visit the new plant and to discuss plans for a very active sales campaign to be conducted during the coming year. Glenn C. Webster, general manager of the works, F. C. Maxheimer, sales manager, and W. H. Fisher, superintendent of the factory, expressed anticipations for the biggest fixture year in history.

Wireless in War.

The British Marconi Company has experienced great activity in its field station department consequent upon the Balkan and Italian military doings of the past year or two. Progress has been made with the design and manufacture of portable wireless telegraph stations "to meet the demands of the armies of the world," the following having been added to standard types of stations: A three-kilowatt station for transport by cart or

motor car; a 1.5-kilowatt station for transport by horses or camels; 1.5-kilowatt cabinet station for use as a permanent station where space is limited.

The total sales for field-station apparatus nearly quadrupled during the year 1912, important orders being received from the British war office, and the Italian, Turkish, Roumanian, Greek and Servian governments. Arrangements have been made which will enable the company to make immediate deliveries of all classes of field stations for which a big demand arises unexpectedly.

Annual Picnic of Robbins & Myers.

On August 9, Springfield, O., witnessed a parade of the employees of the Robbins & Myers Company which was above the ordinary and a most interesting exhibition. The event was the annual picnic of the employees of the Company, and the entire arrangement was in charge of the Advance Club, made up of the department heads of the plant, a picture of whose members appears in this issue. The Club is composed of the officials of the Company, the office executives, and the factory department heads, and they meet monthly in interesting social and educational meetings.

The parade was imposing, headed by a cordon of police officers, as an escort, followed by two large American flags, the famous Cadet Band, and a huge banner bearing the Company's name. Next came the officials of the Company, the president and vice-president in a handsome Packard roadster, immediately followed by the secretary and treasurer. Next came the office force, followed by the engineering corps and the factory employees.

The 400 young women of the winding and assembling departments made a striking appearance, all dressed in white and each wearing a broad-brimmed white headpiece, marching four abreast. Their division covered two city blocks and they were loudly cheered from the side lines.

Next came the second band, then the factory departments marching in the same formation, each department headed by its foreman as captain with a standard bearer designating the name of the department and the class of work.

Enthusiasm ran rife. Yells were heard from hundreds of throats. Interspersed throughout the lines were scores of banners indicating the class of product such as "What do we Make," "Read the Sign," "Our Motors Run the World," "Our Fans Cool the World," "We Make Springfield Prosperous" and such banners as "What's Doing," "Picnic," "Where," "Neff Grounds," "Who's Going," "Everybody." There were more than 60 of such banners, some of the wording affording amusement as well as information. Each and every employee carried a cane and a red pennant which lent color to the scheme and made a pleasing effect.

This concern has risen so rapidly in manufacturing circles that even residents of Springfield did not know the magnitude of the plant. Not only does it employ a large force but the caliber of the employees is of the best.

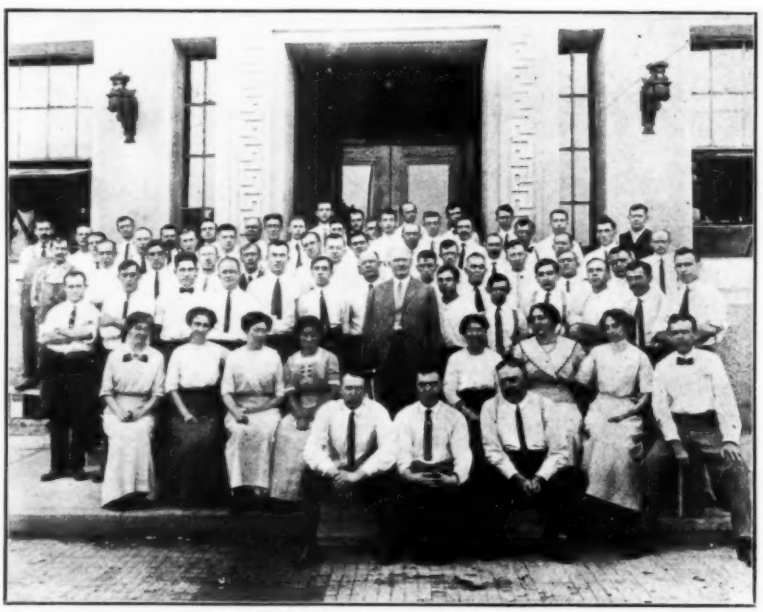
Parade of Employees of Robbins & Myers Company.

Thirty coaches had been arranged for transportation to the picnic grounds, nine miles away at beautiful Yellow Springs.

The athletic events, aquatic sports and dancing were indulged in and all care thrown away. The entire day was given to fun and everybody took a hand. The Company made all this possible by furnishing anything and everything that the picnic committee or Boosters Club wanted or needed.

The growth and development of this company has been phenomenal. From a small factory employing only 100 men it has risen by leaps and bounds until it now has branch houses, warehouses, and sales organizations in all the largest cities.

The factory is a model in architecture and equipment. Machinery people point to the Company as an example of all that is up-to-date in shop equipment. The close relation of foreman, sub-foreman and employee is no better exemplified than in this Company. Progress, the upholding of the standard products, harmony and boost have been the elements of a successful past and the spur for further endeavor.



Members of the Advance Club.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

GALLUP, N. M.—The Peoples Light & Power Company has been granted a franchise in this city.

MANASSAS, VA.—$75,000 will be expended for a light and water system. The City Clerk has the matter in charge.

GRAYVILLE, ILL.—Improvements are necessary at the light and water plant. Address the city clerk for further particulars.

GRAND MOUND, IOWA.—The Council is planning ways and means to secure electric lighting. Address the city clerk for particulars.

VELASCO, TEX.—Velasco Power Company has been incorporated with a capital stock of $3,000 by J. T. Dingle, D. T. Austin and P. F. Combs.

OROVILLE, CAL.—The Oro Electric Corporation has been granted a permit for its Lime Saddle power plant in the Plumas National Forest.

WELLINGTON, TEX.—The Wellington Light & Power Company will erect an electric light and power plant here. D. E. Godwin is interested in the project. D.

PINEVILLE, KY.—Sandy Valley Light & Power Company has been incorporated with $20,000 capital stock to operate electric lighting and power plants.

SPOKANE, WASH.—Spokane Valley Power Company has been incorporated with a capital stock of $200,000 by J. W. McBride, V. E. Bayless and others.

KERRISDALE, B. C.—Point Grey Council has decided to spend $500 to secure the services of an engineer to report on the cost of a municipal lighting plant. O.

McALISTERVILLE, PA.—F. G. Portzline has purchased the dam at Rocklandmill. The new owner will develope electric energy for lighting and power purposes.

HAMPTON, IOWA.—The business men are raising money to secure electric lights. $2,500 has already been subscribed. Address the City Clerk for information.

PARK PLACE, TEX.—Park Place Water, Light & Power Company has been incorporated with a capital stock of $10,500 by C. J. McCarty, F. A. Tucker and Lewis Fogle.

GLENWOOD, MINN.—An ordinance has been granted authorizing Oscar Clausen and J. M. Whalen to erect, construct, install and maintain an electric light plant in this city. C.

BIRD ISLAND, MINN.—A franchise has been granted to H. B. Rutledge, representing the Central Minnesota Light & Power Company to install an electric light plant. C.

ERLANGER, KY.—The Erlanger Light & Power Company has secured a franchise for operating an electric light system, and has selected a site for the erection of its power plant.

HENDERSON, KY.—An appropriation of $30,000 has been made for the purchase of a boiler, condenser and turbine and the erection of a new stack for the municipal power plant.

NASHVILLE, TENN.—The Fletcher Manufacturing Company will require motors for the operation of woodworking equipment in a furniture factory which it is now constructing.

KERENS, TEX.—The Corsicana Gas & Electric Company will construct an electric transmission line to Kerens from its plant in Corsicana for the purpose of providing this place with light and power. D.

VAN NUYS, CAL.—The Southern California Edison Electric Company is about to start the work of extending its electrical system from this city to Owensmouth, a distance of about eight miles. T.

OCOEE, TENN.—The Tennessee Power Company is preparing to construct a line from its Ocoee River water power plant to the new plant of the Aluminum Company of America at Marysville. G.

JEROME, ARIZ.—The Arizona Power Company is contemplating making a large number of improvements in the near future in the way of erecting new electric lines, installation of electric motors, etc. T.

BLACK LICK, PA.—The Blacklick Light, Heat & Power Company has been incorporated with a capital of $5,000. The incorporators are C. V. Bergh, A. G. Lanners, N. B. Courtright and W. L. Scott.

GOLD HILL, ORE.—The substation of the California-Oregon Power Company, in this city, was damaged in a recent fire to the extent of $7.500. The station will be rebuilt at once and a new transformer installed. O.

FT. WAYNE, IND.—The Board of Public Works will receive bids for complete construction, installing and furnishing ornamental posts to be equipped with electric lamps, on several streets. Address H. W. Beckes, city clerk.

MORTON, WASH.—The Morton Electric Company will begin work at once on the construction of a hydroelectric power plant on the Tilton River, same to be capable of developing 250 horsepower. The plant will cost $10,000.

ALBANY, ORE.—The City Council is contemplating the installation of a cluster lighting system in the business section, current being furnished by the Oregon Power Company. Prominent business men of the city heartily endorse the system and same will probably be carried. O.

MARSHALL, TEX.—The City Commission has granted the Marshall Traction Company a new franchise for its street railway system here. The same interests are preparing to enlarge the electric light and power plant which they own. D.

MARBLE ROCK, IOWA.—The Marble Rock City Council passed an ordinance authorizing the issuance of bonds of $24,000 to finance the construction of a dam across the Cedar River to furnish power for a lighting plant.

ROCK FALLS, ILL.—The Board of Improvements of Rock Falls has been instructed to make an estimate on the cost of certain repair work and improvements for the electric light power plant. P. A. Whitney, electrician, has the matter in charge.

LOUISVILLE, KY.—The Louisville branch of the American Oak Leather Company will purchase a dynamo and motors for use in the operation of cutting equipment in a recently completed addition. B. M. Henry is manager of the plant. G.

CAMPBELLSVILLE, KY.—The Campbellsville Light & Water Company has been organized, and following the purchase of a franchise created by the City Council will begin the erection of an electric light and power plant. G.

MALDEN, MASS.—The Street and Water Commission is working out a plan for a "White Way" on the business streets of Central Square, Malden, and has asked the City Council for an appropriation of $42,000 for street lighting next year.

SAN FRANCISCO, CAL.—The Lompoc Gas & Electric Company has been granted permission by the State Railroad Commission to issue bonds to the amount of $75,000 for improvements of the company's system near Santa Barbara. T.

GRAND RAPIDS, WIS.—Jacobson & Ackerman have secured a contract including all plans and construction work for a modern hydroelectric plant to supply power to the quarry of the Montello Granite Company, of Montello, and for lighting the village.

SAN FRANCISCO, CAL.—Permission has been granted by the State Railway Commission to the Southern Counties Gas & Electric Company to issue bonds to the amount of $75,000 for use in improving its system in Southern California. T.

LOUISVILLE, NEB.—The Council has granted a 50-year franchise to two lighting companies. One is the Lincoln-Omaha Interurban Street Railway Company and the other is the Continental Gas & Electric Company of Cleveland, W. H. Abbott, of Cleveland, representing his company before the Council. The promoters of the two companies state that work of installing plants will begin very soon.

MOORESVILLE, IND.— The Mooresville Utilities Company has filed a petition with the Public Utility Commission for permission to issue $10,000 worth of bonds for the purpose of making extensions and improvements. The company supplies water, light and power to this town.

JOHNSON CITY, TENN.—Gen. J. B. Cox is contemplating building an interurban trolley line to connect Johnson City and Bristol and is also establishing a great power plant on Clinch River in Hancock. This plant is to be known as a hydrostatic electric power plant and it anticipates the expenditures of $20,000,000.

SALT LAKE CITY, UTAH.—A campaign to induce the City Commission to erect a municipal electric light plant in City Creek canyon to supply the power for the arc lamps on the streets, has been launched by the Salt Lake Real Estate Association. W. G. Tuttle is one of the leaders of the movement.

LOS ANGELES, CAL.—Authority has been granted by the State Railway Commission to the Torrance Water, Light & Power Company to issue $115,000 in bonds, and stock to the amount of $34,000, for the betterment and improvement of the company's system at Torrance, a growing town a short distance south of this city. T.

PARK CITY, UTAH.—The City Council has granted a franchise to the new Light, Heat & Power Company petitioned for by Louis A. Jeffs, who agrees to furnish the light, heat and power for a period of 25 years from the date of passage. The new company expects to be operating in Park City on or before January 1, 1915.

SAN JACINTO, CAL.—Ralph Bandini, Title Insurance Building, Los Angeles, has applied to the Board of Control at the State Capitol for a permit to use the water of the South Fork Falls, San Jacinto River, to generate electrical power, which it is expected will be used in Hemet, San Jacinto Valley and Perris Valley.

TACOMA, WASH.—Bids will be called for by the Evans-Dickson Company, electrical engineers, this city, for a hydroelectric plant for the town of Eatonville. $12,000 bonds will be issued. Bids will be divided into three parts. One set will be taken on the headworks and pipe line, another on the machinery and transmission line, and the third on the town distributing system. C.

MONTGOMERY, W. VA.—Montgomery Utilities Company has been incorporated with an authorized capital stock of $50,000 for the purpose of owning and operating water, power, electric and gas plants for use of the public. The incorporators are J. S. Lilly and Wesley Wilkes, of Beckley, W. Va.; A. A. Lilly, J. E. Brown and A. H. Curry, of Charleston, W. Va.

CHICAGO, ILL.—Sealed proposals will be received at Room 406 City Hall for furnishing and delivering nine direct current electric motors at the Water Works Shops 2304 South Ashland Ave. Motors will vary in size from 4 horsepower to 15 horsepower according to plans and specifications on file in the office of the department of Public Works of said city. Address L. E. McGann, commissioner of public works, Room 406, City Hall.

OGDEN CITY, UTAH.—A proposition to extend the "White Way" is under consideration. The plans for the construction of the extended lighting system are similar to those adopted to bring about the present street lighting. The city, the Ogden Rapid Transit Company and the Utah Power & Light Company will stand the greater expense. A small sum must be contributed by the property holders on the streets lighted.

ASHTON, IDAHO.—The Public Utilities Commission has been called upon to pass on an application for a certificate of convenience and necessity which will give to several Eastern Idaho cities competitive electric power for lighting and power purposes, if it is approved, for such an application was made of record with the Commission as filed by the Ashton & St. Anthony Power Company, a corporation capitalized for $250,000. It is stated in the application that the Ashton & St. Anthony Power Company has a dam for power purposes on the north fork of the Snake River, two miles west of Ashton, where it proposes to have its main power plant located for the generation of electricity for delivery for power purposes. It proposes to furnish power to the cities of Ashton, Marysville and St. Anthony.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SIOUX FALLS, S. D.—New State Telephone Company will improve the entire system. C.

WINTERHAVEN, FLA.—A telephone system will be established by the Lake Region Telephone Company.

CAMBRIDGE, ILL.—The Citizens' Mutual Telephone Company has purchased a site and will build a modern telephone exchange.

TAMPA, FLA.—Peninsular Telephone Company will extend service to tourist resorts in this part of Florida. W. G. Brorein is general manager.

MEXIA, TEX.—The Mexia Light, Water & Sewerage Company is preparing to equip its pumping plant, situated six miles from here, with electric power.

PAW CREEK, N. C.—The Paw Creek Telephone Company has been incorporated with a capital stock of $2,000 by Plummer Stewart of Charlotte, and others.

BERRYVILLE, ARK.—The Berryville Telephone Company has been incorporated with a capital stock of $10,000 by W. G. Hanbury, R. E. Norris, and others.

COLLINSON, LA.—A telephone company has been organized here with F. McCormick as president. The company plans to connect the farmers with Collinston.

ORANGE, CAL.—The Postal Telegraph Company has applied for permission to build lines into Orange from Santa Ana along the Pacific Electric right of way.

LITTLE ROCK, ARK.—Perryville Telephone Company has been incorporated with a capital stock of $10,000 by W. G. Hanbury, R. E. Norris, Tom Morris and others.

AUBURNDALE, FLA.—The Lake Region Telephone Company of Winterhaven, will construct a metallic selective-ringing telephone system. Address C. M. H. Eycleshimer, engineer, for particulars in regard to this work.

BOWMAN, GA.—Application has been made for the incorporation of the Farmers Telephone Company, with a capital stock of $1,500. B. F. Burnette, A. A. Seymour are named among the incorporators.

SAN LUIS OBISPO, CAL.—The Pacific Telephone & Telegraph Company is arranging for the removal of all poles from the business section of this city and the installation of a block system.

COMPTON, CAL.—The Pacific Telephone & Telegraph Company has completed negotiations for the extension of the toll and long-distance lines to the subscribers of the Consolidated Utilities Company, of this city. T.

GARFIELD, WASH.—The Inland Independent Telephone Company has obtained a franchise from Garfield giving the company right of way through the city. The line will extend from Spokane to Pullman and ultimately to Boise, Idaho. O.

ALBANY, ORE.—According to statement made by George Sanders, local manager of the Bell Telephone & Telegraph Company, the lines will be reconstructed from Portland to California. New material will be substituted for the old and facilities will be added. O.

COVINA, CAL.—The Home Telephone Company of this place has been granted permission to create a bonded indebtedness of $200,000, and to issue $40,000 of said bonds. The money derived from the sale of these bonds will be used to improve and extend the system. T.

SHAMBAUGH, LA.—The Shambaugh Central Telephone Company has been organized with a capital stock of $10,000 for the purpose of carrying on the rural telephone business in Shambaugh. M. G. Palmer is the president; S. R. Turner, vice-president. The company proposes to put in new poles and wires in its system in Shambaugh.

BIG TIMBER, MONT.—W. S. McKenzie, of Springdale, and John Fryer, Livingston, are arranging for telephone connections between a line to be built from Duck creek, on the north side of the Yellowstone, and the Home Telephone Company of this city. The line will take in all ranches lying north of the river. C.

SEATTLE, WASH.—Within two months Seattle will be in direct communications with Ketchikan by wireless, according to J. R. Erwin, superintendent of the North Division of the Marconi Wireless Telegraph Company. A new station will be erected at Charcoal Point, about two miles from Ketchikan. C.

CHEHALIS, WASH.—The County Commissioners have granted franchises to the Riney Valley Telephone Company for a line from Filton Ferry to Randle by way of the Cowlitz River road; and to the Hannaford Skookum Telephone Company for a line extending northwest of Centralia in the Manna Hanaford Valley. O.

GLENDIVE, MONT.—The Pioneer Telephone Company of this place has been incorporated for $40,000 by C. A. Rasmusson and others. It is the purpose of the new company to build lines between the cities of Glendive and Circle, between Circle and Jordan and between Circle and Newlon. Construction work will begin shortly.

ELECTRIC RAILWAYS.

(Special Correspondence.)

PALO ALTO, CAL.—The Councilmen of Palo Alto have proposed a $10,000 bond issue for the construction of a subway here.

EL PASO, TEX.—The El Paso Electric Street Railway Company has been granted permission to construct three new car lines.

RODEO, N. M.—The citizens of the lower valley are beginning to discuss the feasibility of an electric line from Paradise to San Simon.

MT. VERNON, ILL.—At a special meeting of the City Council a franchise was given to the Mt. Vernon Traction Company to build lines throughout the city.

LEXINGTON, KY.—The Kentucky Utilities Company is planning the construction of a six-mile traction line from Somerset to Burnside. Address Manager Spragle at Somerset. G.

LONG BEACH, L. I.—It is understood that a plan has been suggested by Ralph Peters, president of the Long Island Railroad, to build a new road to Long Beach. This would cost $140,000.

MADRAS, ORE.—H. P. Schell, of Tenino, Wash., states that construction work will begin on the Metoiles Prinville Railroad within 60 days. The Deschutes Power Company is to furnish the power.

DES MOINES, IOWA.—It is rumored in this vicinity that the McKinley interests have purchased the Grinnell Electric Company, and this is believed to be part of a project to tap the Des Moines River Valley with an interurban line.

PADUCAH, KY.—A surveying corps has been at work on the route of the proposed interurban between this city and Smithland. Judge Abell is chairman of the committee to secure right of way from Smithland to Clark's Ferry.

JACKSONVILLE, FLA.—Direct street car connection between Jacksonville and Panama Park is possible in the near future if the Jacksonville Traction Company will consent to certain conditions which the Board of County Commissioners will impose.

NASHVILLE, TENN.—The Middle Tennessee Traction Company is preparing to construct an electric railway from Franklin to Fayetteville, by way of Eagleville and Shelbyville. L. M. Buford, Franklin, Tenn., is interested.

CHICAGO, ILL.—A proposition to build a street car line between Chicago and Evanston has been presented to the members of the Evanston Council by L. E. Myers, a street railway builder, who guaranteed to have the line in operation in 18 months. The undertaking means an outlay of $500,000.

KENTON, O.—It is understood that the Columbus, Kenton & Toledo Traction Company is preparing to build the line from Columbus to Findlay. New York capitalists are said to be behind this. J. W. Caine, a local business man, has been elected president of the company.

DAVENPORT, IOWA.—B. J. Denman, superintendent and assistant general manager of the United Light & Railways Company, has announced that about $150,000 will be spent on improvements to the Muskegon Interurban line. The electric signal block system may be installed.

MILWAUKEE, WIS.—Plans for the acquisition of the necessary right of way from this city to Beaver Dam have been taken up by the Board of Directors of the Milwaukee Western Interurban Road The directors assert that active construction work will be started early in the spring.

SANTA MONICA, CAL.—Practically all of the right of way has been secured for an electric line to run between this city and Vineyard Junction, a distance of about nine miles. A rare residential district will be opened by this line. which will cost $500,000 to build and equip. T.

FRESNO, CAL.—In the hearing before the Railroad Commission on the application of the Fresno, Hanford & Summit Lake Interurban Railway Company to issue bonds, it developed that Kimball & Somers of Oakland, had agreed to supply $375,000 to build 20 miles of the road between Fresno and Selma. They agree to take six-per-cent bonds at $80 in compensation.

PRINVILLE, ORE.—H. P. Shell, of Tacoma, Wash., will build an electric line between this city and Metolius, on the Oregon Trunk Railroad,—proposed road will be 30 miles long, and will operate through one of the richest farming sections in Eastern Oregon. The business interests of this city who are interested in the movement are represented by Thomas N. Baldwin of the First National Bank, here. O.

SEATTLE, WASH.—The City Council has decided to accept the offer of the owners of the Highland Park & Lake Burien street car line to give to the city the eight-mile stretch of electric railway providing the city assumes the cost of operating the line. The railway was erected several years ago at a cost of $124,000. It is understood that this line will be improved and materially extended, so as to take in new territory.

MINNEAPOLIS, MINN.—The Minnesota Central Railway Company, which will be commonly known as the "Central Interurban," has been incorporated in Maine with $1,000,000 capital stock and will begin work immediately upon the construction of a line from Minneapolis to St. Cloud, with a plan for ultimate continuation to the Cuyuna range and Mille Lacs. E. G. Potter, of Minneapolis, is president; Edgar M. Nye, secretary, and Edwin M. Potter, treasurer, of the company.

TOLEDO, O.—The Toledo, Ann Arbor & Jackson Railroad, which has been in course of construction for the past several years and which, within the past year, has started to operate cars between Toledo and Petersburg, Mich., has filed with the Ohio and Michigan Public Utility Commissions, applications for permission to issue $850,000 of bonds, the money to be used for the extension of the line from Petersburg to Jackson, Mich., a distance of 38 miles, and from Petersburg to Ann Arbor, a distance of 45 miles.

PORTLAND, ORE.—Residents of the Peninsula District have petitioned the City Commission for a cross-town car line, starting at Greely Street on Killingsworth Avenue, and extending on Killingsworth Avenue to East Thirty-Third Street. The East Side Business Men's Club and the Greater East Side Club are back of the movement. L. M. Pepper is chairman of the Transportation Committee of the East Side Business Men's Club. Proposed line will be built by Portland Railway Light & Power Company. O.

NASHVILLE, TENN.—The Tennessee & Kentucky Railroad Company has been organized for the purpose of constructing and operating an interurban railroad from Nashville in the direction of and to Springfield, and thence in the direction of and to Adairville, Ky. The incorporators of the company are J. P. Helms, Alfred G. Merritt, Jr., H. L. Sperry, Paul D. Denton, B. F. Cornelius, R. W. Bratton, J. C. Collins, Clyde Shropshire, J. L. Weakley, J. W. Tilford and A. C. Ferris. The capital stock will be $10,000. The new interurban will be operated by electricity and compressed air.

ANACORTES, WASH.—Residents of Whidby Island have subscribed several thousand dollars of the $50,000 which is to be expended in constructing the proposed electric railway which is to be built from this city, across Whidby Island to LaConner. Residents of LaConner have subscribed $40,000 and pledged $30,000 additional, to be used in the construction of their end of the line. Property owners and business men of Anacortes have agreed to raise $60,000 within thirty days. President Bowen, care of Chamber of Commerce, here, announces that work of construction will begin during September.

NEW ORLEANS, LA.—The Orleans-Kenner Electric Railway Company has announced that all options on terminal property have been obtained and that construction will begin soon on the line, which is to extend from a terminal station on University place to the towns of Shrewsbury, Harahan, Kenner and Hanson City, La., 15 or 20 miles altogether. An expenditure of $700,000 is proposed, and perhaps more than that. It is expected to complete the entire line within 24 months after receiving the necessary franchise. A. Smith Bowman is president; J. D. Purcell and Andrew W. Fitzpatrick, vice-presidents; and E. F. Ullmer, secretary-treasurer, of the company.

BLOOMINGTON, ILL.—G. G. Faget, consulting engineer for the French-American Bank of Paris, France, is in Central Illinois for the purpose of making an inspection of a proposed trolley road from Rockford in Northern Illinois, due south to a point in Central Illinois. F. W. Cherry, promoter of the proposed road, has interested French capital in the proposition, and if M. Faget reports favorably the road will be constructed. It is proposed to follow the banks of the Illinois River closely, striking considerable territory at present not served by a steam or trolley line. It is probable that Peoria will be the southern terminal, making connection with the Illinois Traction system for St. Louis.

FULLERTON, CAL.—A wealthy resident of this part of the county is working on a proposition to form a stock company to build an electric road between Fullerton and Anaheim, a distance of three miles. He states that a number of local people will take stock in such a corporation. The plan is first to build the electric to Anaheim, then from Fullerton to Brea, and from Fullerton out to the Yorba Linda district, making Fullerton a central point for all of these short lines. It is found that power can be had at a low rate from one of the large electric companies and it is believed that these short lines can be made to pay dividends and at the same time build up this part of the county.

FINANCIAL NOTES.

The money market has grown easier, due in large measure to the distribution of United States Treasury funds among the banks of the surplus crop states. While the outlook for the corn and cotton crop is still obscure, an offsetting feature has been the great amount of grain carried over from the present harvest. The wheat outlook continues bright, and because of the heavy liquidations of old wheat during the past few months, the banks of the Northwest are in excellent shape. Business in general shows a slightly slackening tendency. Under all the circumstances this is as it should be. The electrical industry continues active, with every indication of unabated prosperity.

At a meeting the stockholders of the Electric Properties Company, the plan for reduction and readjustment of the capital stock, as formulated by John F. Wallace, Henry R. Hayes, and Albert M. Chambers, committee, was approved. The stockholders voted to sell the assets of the Electric Properties Company to a new company, organized under the laws of Virginia, to be known as the Electric Properties Corporation, with an authorized capitalization of $4,000,000 six per cent cumulative preferred stock, and $4,000,000 common stock. The outstanding capitalization of the new company will consist of the authorized common stock, and $3,920,200 of the preferred stock, and $411,533 or five-year six per cent redeemable notes or bonds. The latter represents all accumulative dividends upon the outstanding preferred stock for the period from February 1, 1910, to April 30, 1912. The dividends upon the preferred stock of the old company, from May 1, 1912, to September 1, 1913, will be paid in cash. The preferred stock of the old company will be exchanged, par for par, for the preferred stock of the new company. The $6,000,000 common stock of the old company will be exchanged at the rate of two shares of the new stock for three shares of the old stock. The officers of the Electric Properties Corporation will be: President, John F. Wallace; vice-president, A. M. Chambers; secretary and treasurer, John Seager. Electric Properties Corporation will own all the capital stock of Westinghouse, Church, Kerr & Company.

The report of the Kings County Electric Light & Power Company for the month of July shows that there has been considerable conversion of the bonds of this company. At this time last year the stock outstanding amounted to $10,000,000 and at present this item has increased to $12,795,100. This conversion of the bonds has had a very favorable effect on the price of the stock, which at one time showed an advance of more than 12 points over the low price of the year. This was due largely to the fact that the conversion has reduced the floating supply of the stock materially. The bonds have been steady. The combined report of this company and the Edison Electric Illuminating Company of Brooklyn, shows that the gross operating revenue for the month of July was $420,453, an increase of $29,233 over the same month a year ago. After all expenses, taxes and other charges had been deducted the net income for the month was $80,956, an increase of $26,807, which by the way is a considerable increase for the month of July. Since the first of the year these companies show a gross operating revenue of $3,209,139, an increase over the same period of a year ago of $219,063. The net income for the seven months was $737,149, an increase over last year of $123,070. Among some of the important items to show a decrease was the interest on the funded debt for the seven months of this year of $13,863. During the month of July the interest on the unfunded debt decreased $1,484 to $523, but for the seven months this item had increased $21,500 to $26,819. In all the amount put aside for depreciation for the seven months of the year was $5,456 less than that of a year ago.

New York Edison Company, which is about to increase its capital stock outstanding from $50,400,400 to approximately $66,000,000, is earning operating revenue at the rate of close to $24,000,000 a year. The gain in output thus far is 20 per cent greater than during the corresponding period a year ago and is expected to make the output for the entire year 1913 between 10 per cent and 20 per cent greater than in 1912. The average rate obtained in 1913 will be a little less than that in 1912, but only a little unless some reduction in rates is effected during the next four months. A 19 per cent gain in revenue would produce operating revenue of $25,000,000, but the decline in price received would indicate gross of $24,000,000 or thereabouts, a gain of about 14 per cent. The company's statement of operating expenses of $7,428,997 for the six months ended June 30 includes a half yearly renewal and contingency account of more than $1,500,000 which the company charges to operating expenses, although erroneously so according to the Public Service Commission. Including the reserve for renewals and contingencies, the six months total of $7,428,997 compares with $12,351,343 for the full year 1912. Considering the larger output and the larger renewal and contingency reserve, it appears that the company's operating ratio is holding its own with last year's. Non-operating revenue of $594,336 for the six months ended June 30, 1913, is approximately two per cent ahead of that in the same period of 1912. Income deductions ran about one and one-half per cent greater than in 1912. The result of the six months' earnings after deducting half yearly subway rentals of $650,000 is a balance for the stock of $2,895,326. This compares with half yearly dividend requirements of about $1,500,000. It is equivalent to 5.8 per cent on the outstanding stock. More is expected to be shown for the balance of the year so that earnings for the $50,400,400 stock may be expected to exceed 12 per cent.

Dividends.

West Kootenay Power & Light Company; quarterly dividend of one per cent, payable September 1, to stock of record August 2.

Cities Service Company; one half per cent monthly dividend on preferred stock, payable September 1, to stock of record August 16.

Northern Texas Electric Company; semi-annual dividend of $3.00 per share on the preferred capital stock and a quarterly dividend of $1.75 per share on the common capital stock. Both payable September 2, 1913, to stock of record at the close of business August 20.

The United Light & Power Company of New Jersey; to holders of its $1,618,000 guaranteed collateral trust six per cent three-year notes, due December 1, 1914; semi-annual interest defaulted June 1 will be paid on and after August 26.

Reports of Earnings.

UTILITIES IMPROVEMENT COMPANY.

Utilities Improvement Co. reports earnings for July, 1913, and the seven months ended July 31, 1913, as follows:

July gross	$138,014
Net	135,324
Dividends	107,500
Surplus	27,824
Seven months' gross	996,918
Net	980,129
Dividends	752,500
Surplus	227,629
Total accumulated surplus to July 31, 1913	517,380

REPORT OF MONTHLY EARNINGS.

KINGS COUNTY ELECTRIC LIGHT & POWER.

	1913	1912
July gross	$420,453	$391,221
Net	146,671	123,875
Other income	5,547	4,518
Total income	152,218	128,393
Surplus after charges	80,956	54,150

DETROIT EDISON.

	1913	1912
July gross	$398,941	$308,118
Net	138,814	111,887
Surplus after charges and deficiency	42,223	20,482

COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY.

	1913	1912
June gross	$213,804	$69,064
Net	159,604	60,473
Surplus	79,604	30,473

CHATTANOOGA RAILWAY & LIGHT COMPANY.

	1913	1912
June gross	$101,635	$89,470
Net	41,169	34,578
Balance after charges	17,965	12,432

UNION RAILWAY, GAS & ELECTRIC COMPANY.

	1913	1912
June gross	$354,373	$272,714
Net	164,914	110,562
Balance after charges	67,823	41,260

PORTLAND RAILWAY, LIGHT & POWER COMPANY.

	1913	1912
June gross	$568,875	$582,964
Net	277,191	305,282
Balance after charges	105,653	156,242

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 23.	Aug. 18.
American Tel. & Tel. (New York)	129¾	129½
Commonwealth Edison (Chicago)	147	149
Edison Electric Illuminating (Boston)	272	270
Electric Storage Battery common (Philadelphia)	47	47
Electric Storage Battery preferred (Philadelphia)	47	47
General Electric (New York)	145½	141½
Kings County Electric (New York)	117½	129
Manhattan Transit (New York)	1⅝	1⅝
Massachusetts Electric common (Boston)	16	14½
Massachusetts Electric preferred (Boston)	71	72
National Carbon common (Chicago)	114	114
National Carbon preferred (Chicago)	113	113
New England Telephone (Boston)	145	145
Philadelphia Electric (Philadelphia)	21⅞	22
Postal Telegraph and Cables common (New York)	84	84
Postal Telegraph and Cables preferred (New York)	66¼	66¼
Western Union (New York)	67	66⅝
Westinghouse common (New York)	71¼	68¾
Westinghouse preferred (New York)	111	111

NASHVILLE RAILWAY & LIGHT COMPANY.

	1913	1912
June gross	$179,176	$167,167
Net	69,937	70,667
Balance after charges	31,436	33,673

CITIES SERVICE COMPANY.

The Cities Service Company reports earnings for July, 1913, and the twelve months ended July 31, 1913, as follows:

	1913	1912
July gross	$ 127,086	$ 81,302
Net	106,504	75,946
Preferred dividends	63,538	50,963
Common dividends	33,559	18,311
Surplus	9,407	6,672
12 months' gross	1,487,344	1,116,291
Net	1,394,857	1,040,137
Preferred dividends	699,304	574,036
Common dividends	326,354	189,240
Surplus	369,198	276,860

MIDDLESEX & BOSTON STREET RAILWAY.

The gross earnings of the Middlesex & Boston Street Railway Company for July were $100,269, an increase of 11.04 per cent over a year ago. The balance available for dividends increased 22.71 per cent. The figures compare with a year ago as follows:

	1913.	1912.
Gross	$100,269	$90,302
Operating expenses	63,830	58,258
Net	$ 36,438	$32,043
Interest	13,794	13,590
Available for dividends	$ 22,644	$18,453

Net earnings show a gain of 13.72 per cent, after an increase of 9.56 per cent in operating expenses.

PERSONAL MENTION.

MR. B. P. STEVENS, who recently resigned as president of the Lehigh Valley Transit Company, has been elected president of the Mahoning & Shenango Railway & Light Company and its subsidiary companies, the appointment to take effect October 1. He will succeed MR. NORMAN D. MAC CRAWFORD, who has tendered his resignation.

MR. LAWRENCE W. CADY, formerly consulting electrical engineer for the Browning Engineering Company, Cleveland, O., and its allied companies, is now engaged in general consulting work, with offices at 1537 Robinwood Avenue, Lakewood, O. Mr. Cady is a specialist on the design and application of factory and residence electrical apparatus.

MR. GEORGE P. LAWRENCE has resigned as member of the Public Service Commission of Massachusetts, and Governor Foss has accepted the resignation. Mr. Lawrence states that he finds he cannot give the necessary amount of time to the duties of the position. The resignation is effective September 1. Mr. Lawrence's service on the board began July 1 of the present year.

MR. JOHN R. GRAHAM, president of the Bangor Railway & Electric Company, of Bangor, Me., entertained a party of twenty-five men prominent in public affairs and street-railway business in Massachusetts, on a trip to Portland and Augusta last week. The party went by special Pullman, and visited points of interest and recreation in the Maine centers. The guests included former members of the rapid transit committee of the Massachusetts Legislature of 1893, of which Mr. Graham was also a member.

MR. G. W. BORST, who has for the past three years been connected with the engineering department of the Western Electric Company, Chicago, has accepted the position of chief electrical engineer with the Chicago Fuse Manufacturing Company, made vacant by the resignation of MR. C. T. McDONALD. Prior to Mr. Borst's connection with the Western Electric Company, he was associated with the Westinghouse Electric & Manufacturing Company, Pittsburgh. He assumed active charge in his new position on July 1.

MR. W. C. WING, who for some time has been connected with the sales engineering department of the National Carbon Company, of Cleveland, O., has accepted a position as assistant to Mr. F. D. Barrington, district manager at St. Louis of the Westinghouse Lamp Company. Mr. Wing, before his connection with the National Carbon Company, was assistant sales manager of the Brilliant Electric Works of the General Electric Company. He is an enterprising and energetic representative, and has a wide circle of good friends and acquaintances in the industry.

MR. EDSON O. SESSIONS has opened an office in the Marquette Building, Chicago, for consulting and expert engineering service. Mr. Sessions has had over 20 years of service in construction and engineering work. He is a Fellow of the American Institute of Electrical Engineers, a member of the American Society of Mechanical Engineers, and a member of the Illuminating Engineering Society. Mr. Sessions will undertake the management and supervision of mechanical, electrical, illuminating and water-power betterments, will conduct factory efficiency tests, and make examinations, reports and valuations on electric light, power, railroad and industrial applications.

MR. F. L. ANNABLE, heretofore superintendent of the northern division of the Pacific Electric Railway Company, has been appointed to the position of general superintendent in charge of operation. The creation of this position was a direct result of the growth of the electric railway business in Southern California, both in trackage and number of men employed. MR. A. C. BRADLEY, superintendent of the San Bernardino division, is to be Mr. Annable's successor as superintendent of the northern division, while MR. M. P. GROFTHOLDT, superintendent of the Riverside division, will have his jurisdiction extended over the San Bernardino division. This combining of the San Bernardino and Riverside divisions creates a new division to be known as the eastern division with offices at both San Bernardino and Riverside. MR. EDWIN CLARK, who has been assistant superintendent of the northern division, is transferred to the western division in the same capacity, where the constantly increasing beach travel makes the increased supervision a necessity. MR. H. E. RODENHOUSE, a former assistant superintendent of the road, takes Mr. Clark's old place on the northern division.

MR. J. R. McKEE, a vice-president of the General Electric Company, and one of the pioneers in the electrical industry, has tendered his resignation and will retire from the company. This announcement confirms the rumor, which has been current for several months, that Mr. McKee desired to devote all of his time to personal affairs, and would therefore sever his long standing connection with the General Electric Company. Mr. McKee joined the Thomson-Vandepoele Electric Mining Company as president at the time of its organization. He was also manager of the Thomson-Houston Motor Company. These activities in 1890 and 1891 resulted in his being made manager of the power and mining department of the General Electric Company, when it was organized in 1893. The tremendous growth of this branch of the business is perhaps the best evidence of the success which has crowned Mr. McKee's untiring efforts. His field of endeavor was greatly broadened when in 1908 he was appointed chairman of the sales committee. In 1912 Mr. McKee was elected a vice-president of the company. Mr. McKee's resignation after 23 years of active service with the General Electric Company has been reluctantly accepted. As a pioneer in the effort to apply electricity to industrial purposes, Mr. McKee's activities have extended into all parts of the country and through various industries. His circle of friends and acquaintances is unusually large.

OBITUARY.

MR. MICHAEL J. LEARY, general passenger and freight agent of the Connecticut Company, the electric railway system operated by the New York, New Haven & Hartford Railroad Company in Connecticut, died at his home in New Haven, Conn., August 18. He was a native of Enfield, Conn., and was 48 years of age. He had been in the railroad business nearly all his life, having been freight manager for the Valley division of the New Haven road prior to his connection with the electric lines.

DR. THOMAS LANGAN WHITE, aged 59 years, one of the best known business men in McKeesport, Pa., died in his home in that place on August 24 from an attack of pneumonia. He was ill but a few days. Dr. White was formerly president of the White Electric Traction Company, later taken over by the West Penn Railways Company, as well as head of the old McKeesport Light Company. At the time of his death Dr. White was head of the Skelly Lumber Company, the Skelly Dry Goods Company, the White Theater and the White Hotel.

DATES AHEAD.

American Electrotherapeutic Association. Annual meeting, New York, N. Y. September 2-4.

Northwest Electric Light and Power Association. Annual convention, Seattle, Wash., September 3-5.

National Electrical Supply Jobbers' Association. Fall meeting, Clifton Hotel, Niagara Falls, Canada, September 9-11.

Association of Edison Illuminating Companies. Annual convention, Cooperstown, N. Y., September 8-11.

American Electrochemical Society. Semi-annual meeting, Denver, Colo., September 9-11.

American Institute of Electrical Engineers. Pacific Coast convention, Vancouver, B. C., September 9-11.

International Brotherhood of Electrical Workers. International meeting, Boston, Mass., September 15.

Pennsylvania Section, National Electric Light Association. Annual convention, Delaware Water Gap, Pa., September 16-18.

National Association of Corporation Schools, First annual convention, Dayton, O., September 16-19.

New England Section, National Electric Light Association. Annual convention, Hotel Vermont, Burlington, Vt., September 17-19.

Illuminating Engineering Society. Annual convention, Pittsburgh, Pa., September 22-26.

Association of Iron and Steel Electrical Engineers, Annual meeting, New York, N. Y., September 22-27.

Indiana Electric Light Association. Annual convention, Indianapolis, Ind., September 24-25.

Colorado Electrical and Industrial Exposition, Auditorium, Denver, Colo., October 4-11.

Colorado Electric Light, Power and Railway Association, Eleventh annual convention, Denver Colo., October 6.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Hutchinson, Kans., October 9-10.

Telephone Pioneers of America. Annual meeting, Chicago, Ill., October 13-17.

Jovian Order. Annual convention, Hotel Astor, New York, N. Y. October 14-16.

Electrical Exposition and Motor Show of 1913. New Grand Central Palace, New York, N. Y., October 15-25.

Railway Signal Association. Annual convention, Nashville, Tenn., October 14-17.

American Mining Congress. First national mining show, Horticultural Hall, Philadelphia, Pa., October 17-25.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, Ill. October 20-24.

Electric Vehicle Association of America. Annual convention, Hotel La Salle, Chicago, Ill., October 27-28.

NEW INCORPORATIONS.

OLYMPIA, KY.—Olympian Springs Railway, Power & Light Company has been incorporated with a capital stock of $50,000 by James D. Wilson, J. Frank Taylor and A. J. Heliker.

NEW YORK, N. Y.—Elmira Transmission Corporation has been incorporated with a capital stock of $10,000 by F. G. Robinson, Henry Morgan and G. H. Olney, of New York city.

FARGO, N. D.—Carrington Light, Heat & Power Company has been incorporated with a capital stock of $25,000 by C. B. Aasness, Anna F. Aasness and J. E. Galehouse, Jr., all of Carrington.

CHICAGO, ILL.—The Double Phone Sales Company has been incorporated with a capital stock of $2,500 to deal in 'phone appliances, devices, etc. The incorporators are David Swartz, Sol Green and John A. McCarm.

LEBANON, PA.—The North Londonderry & Stauffer Electric Companies have each been incorporated with a capital stock of $5,000, by Abraham G. Stauffer and Oscar Stauffer, of North Londonderry, and George Woodward, of Philadelphia.

CHICAGO, ILL.—K. W. Battery Company has been granted articles of incorporation, capitalized at $10,000, for the purpose of manufacturing and selling storage batteries. The incorporators are Walter Williams, William C. Gilbert and Otto C. Swors.

NEW YORK, N. Y.—Electric & Water Engineering Company of New York, Incorporated, has been granted articles of incorporation with a capital stock of $1,000. The incorporators are William D. O'Grady, Louis G. Duquet and Thomas F. MacMahon, all of New York city.

MANSFIELD, O.—The National Electric Sign & Construction Company has been incorporated with a capital stock of $50,000 for the purpose of manufacturing electric signs. The incorporators are E. P. Robbins, William L. Bailou, H. W. Roberts, P. S. Dittenhafer and F. E. Cavwood.

SALEM, ORE.—The West Stayton Power & Railway Company has filed articles of incorporation, capitalized at $100,000. The incorporators are S. N. Arnold, E. O. Stedter and Grant Thomas. The intention of the company is to build a railroad between Salem and Stayton.

HARRISBURG, PA.—An application for a Pennsylvania state charter will be made by Sophia Trood, Samuel Trood and William A. Darrah for the incorporation of the Industrial Development Company for the purpose of commercially developing electrical and mechanical industries and to include the manufacture and sale of certain electrical devices.

FOREIGN TRADE OPPORTUNITIES.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. In applying for addresses refer to file number.)

NO. 11,537. ELECTRICAL SUPPLIES.—An American consul reports that the manager of the Government electric light plant in the city in which he is located intends to visit the United States next year, and suggests that American exporters of electrical supplies to get in touch with him before he leaves. This person seems very favorably inclined to American goods, and has expressed a desire to come in personal contact with American manufacturers of electrical supplies.

NO. 11,538. WASHING MACHINES.—An importer in a European city, believing that a market can be developed locally, informs an American consular officer that he would like to receive correspondence and catalogues from American manufacturers of water-power and electric washing machines suitable for household purposes. Correspondence may be in English. Quotations should be sent for machines crated f. o. b. New York, Newport News, or Galveston, or c. i. f. city of destination.

NO. 11,534. TELEPHONE SUPPLIES.—A report from an American consul states that the Director General of Telegraphs and Telephones in a Latin American country is contemplating the purchase of telephone supplies. American manufacturers should address this official in Spanish.

NO. 11,535. ELECTRIC CRANES FOR DRY DOCKS.—Supplementing a previous report, an American consular officer advises that an award which was made for two electric cranes for local dry docks has been annulled. New proposals will be received, and a new award will be made shortly. A diagram, with blue prints, showing the dimensions of the two cranes, accompanied the report and may be obtained from the Bureau of Foreign and Domestic Commerce.

NEW PUBLICATIONS.

POLYTECHNICUM.—A new publication, which is a Spanish-American review of science, art and industry, is being published in Madrid, Spain, under the title "Polytechnicum." This is a monthly of 48 pages and uses, of course, the Spanish language.

PORTLAND CEMENT.—The Bureau of Standards, Washington, D. C., has issued a second edition of circular No. 33, containing the United States Government specification for Portland cement. This is the specification in use by all government departments in purchasing Portland cement and was drawn up by a conference containing representatives from each department.

CANADIAN NICKEL INDUSTRY.—The Canadian Department of Mines, Ottawa, Can., has issued bulletin No. 170 entitled "The Nickel Industry: With Special Reference to the Sudbury Region, Ontario," by A. P. Coleman. This bulletin, which is illustrated, comprises 206 pages, in addition to maps, and indicates a thorough investigation of the subject.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has issued a bulletin containing the results of observations made at the magnetic observatory, at Cheltenham, Md., in 1911 and 1912. This report is by Daniel L. Hazard. It gives hourly values of declination, horizontal intensity and vertical intensity of the terrestrial magnetic field, with a summary of monthly and annual means. The instruments used are described and a record is given of the earthquakes and magnetic storms during this period, with reproductions of magnetograms of the latter.

PROPOSALS.

ELECTRIC HOISTS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until September 16 for furnishing two three-ton electric hoists, for delivery at the Navy Yard, Washington, D. C., as per Schedule 5804.

CABLE AND WIRE.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until September 9 for furnishing large quantities of electric cable and wire, as per Schedule 5,777.

CONDUCTOR.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until September 16 for furnishing 1,000 feet of lead-covered paper-insulated single conductor, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 5802.

POTATO PEELERS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until September 2 for furnishing 10 electrically operated potato peelers for delivery at the Eastern Yards, as per Schedule 5,770.

ELECTRIC WORK.—Sealed proposals in triplicate will be received at the office of the Quartermaster, Fort Caswell, N. C., until September 15 for the electric work necessary for the hospital at this post. For further information address James Campbell, first lieutenant, Coast Artillery Corps.

ELECTRICAL APPARATUS.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until September 10, under Canal Circular 789, for furnishing transformers, switchboard, wires and cable, conduit, panel boards and miscellaneous electrical apparatus. Blanks and general information relating to this circular may be had from the office of the General Purchasing Officer or from the assistant purchasing agents in any of the large cities.

With the Electrical Manufacturers

C. E. Franche & Company, Chicago, Ill., has completed a year's test outdoors on roof signs of "Cafes" weather-proof lamp coloring, and states there has been no fading, chipping or peeling noticeable. This it states it will guarantee. The cost is estimated to be about one cent per lamp.

Frederick Rall, manufacturers' agent, 19 Park Place, New York, announces that he has closed arrangements with the Trumbull Vanderpoll Electric Manufacturing Company, Bantam, Conn., to handle its line of knife switches, panel boards, switchboards, and electrical specialties in Greater New York and in the neighboring territory.

The Keystone Driller Company, Monadnock Block, Chicago, Ill., manufacturers of portable well drilling and prospecting machines, and Downie deep-well pumps, has been awarded the contract for its largest Downie double-stroke pump for the city of Naperville, Ill. This pump has a capacity of 350 gallons per minute, with a 300-foot head. The pump is to be direct-connected to a motor.

The Hamilton-Beach Manufacturing Company, Racine, Wis., announces that the "Cyclone" hair dryer is meeting with great popularity among electrical supply jobbers, contractors and dealers and central stations. This dryer is adapted for either direct-current or alternating-current circuits, and gives either a hot or cold blast at the election of the operator. The motor is inclosed in a highly polished aluminum casing, making a fool-proof, rugged and light-weight equipment.

American Engine & Electric Company, Bound Brook, N. J., announces that it has taken over the business of the American Engine Company and will have increased facilities for the manufacture of the American-Ball high-speed steam engines, which have been built by the latter company for the last 17 years. A complete line of electric generators and motors will also be manufactured. These have been designed by W. T. Hensley, who is now associated with the company, it is announced.

Automatic Electric Washer Company, Newton, Iowa, has issued a tasteful pamphlet describing the automatic washer and its auxiliaries, the wringer and mangle. The details of construction and the attractive features of the automatic washer are described and illustrated. These machines are furnished for operation by either electric motor or engine. The envelope in which this booklet is being mailed depicts a stork bearing twins, which are designated as "Profit" and "Satisfaction."

The Pittsburgh Reinforcing Pole Company, Pittsburgh, in the August issue of *The Reinforcer,* publishes a detailed report of the test made in Pittsburgh on July 30 and 31, of Orr reinforced poles. Complete information with respect to the conditions under which the tests were carried out and illustrations make up a very interesting treatise on this subject. The matter is one which is of great interest to pole users and should be in the hands of every one seeking information with respect to the economy which can be secured in the reinforcing of weakened poles in overhead work.

The Duncan Electric Manufacturing Company, LaFayette, Ind., is considering plans for another new extension to its factory. A new four-story structure has just been completed and they anticipate erecting a new addition that will be five stories high, covering a quarter of a block. The new building will be equipped with every modern convenience known to the manufacturing art, and will be fire-proof in every respect. The meters and transformers of the Duncan Company are very extensively used in the United States, and during the past two years they report foreign sales that amount to approximately 30 per cent of the domestic, a condition that is highly gratifying to the company.

Record of Electrical Patents.

Issued by the United States Patent Office, August 19, 1913.

1,070,387. Push-button. J. D. Baldwin and J. J. Schlegelmilch, Cleveland, O. Comprises a conductor which can be rotated to bridge contacts for either a bell or a lamp, and means to rotate such conductor.

1,070,407. Telegraph Typewriter. A. D. Cardwell, New York, N. Y. Comprises groups of working magnets, a line relay and means for shifting the circuits to the relay contacts.

1,070,426. Incandescent-Lamp Lock and Seal. H. Davies and J. Cooke, West New York, N. J. A longitudinally split expansible socket shell has an inwardly extending locking flange.

1,070,432. Bow Contact-Shoe for Trolleys. M. Ergenzinger and H. S. Day, assignors to Westinghouse Electric and Manufacturing Co. Has a plurality of contact members.

1,070,437. Dynamo-Electric Machine. T. Ferguson, Altrincham, England. Has an armature capable of sliding along the shaft to control the output at varying speeds.

1,070,452. Fusible Cut-out. G. B. Griffin, assignor to Westinghouse Electric and Manufacturing Co. A supporting block with conical chamber and fuse-holding body fitting into it. (See cut.)

1,070,454. Electrolytic Cell. T. Griswold, Jr., assignor to The Dow Chemical Co., Midland, Mich. Comprises two bipolar electrodes and a separating member.

1,070,456. Means for Controlling Electric Circuits. J. H. Gugler, Milwaukee, Wis. The main switch is controlled by a polarized electromagnet.

1,070,463. Electric-Lamp Fixture. H. C. Hawks, Newton, Mass. Has a lamp guard screwed into a threaded ring secured to a shouldered recess in the reflector.

1,070,492. Winding for Dynamo-Electric Machines. B. G. Lamme, assignor to Westinghouse Electric and Manufacturing Co. Comprises cross connections joining equipotential points and inductive means for maintaining a predetermined voltage relation between cross connections.

1,070,505. Signal System. J. H. Mattice, Clyde, Kans. An electromagnet controls the circuit-closers through a detent.

1,070,522. Electric Safety-Lamp. J. G. Patterson, Darlington, England. An independent testing lamp is combined with a miner's electric safety lamp.

1,070,542. High-Tension Rectifier for Alternating Currents. L. Schmidt, assignor to Siemens & Halske, Berlin, Germany. Two pairs of rotary sectors make contact with terminal members of the high-potential rectifier.

1,070,556. Device for Detecting Suspended Matter in Gases. W. W. Strong, Pittsburgh, Pa. The movement of suspended particles past the electrodes causes a high-potential spark.

1,070,563. Indicator. E. Waters, Elgin, Ill. A rotatable lamp has spring fingers engaging a pointer.

1,070,568. Method of Melting Metals and Alloys. R. S. Wile, Pittsburgh, Pa. The metal in an electric furnace is covered by an inert molten bath of substance having a higher melting point.

1,070,577. Electromagnetic Drive for Secondary Clocks or the Like. A. O. Benecke, Foxboro, Mass. A pivoted arm electromagnetically operated engages the driving wheels.

1,070,597. Controlling Device. W. H. Gaulke, assignor to Independent Electric Manufacturing Co., Milwaukee, Wis. The armature of an alternating-current electromagnet is controlled by an overweighted arm.

1,070,614. Insulating-Joint. C. A. Kraus, Newton Highlands, Mass. Two

coaxial members, one having an enlarged tubular extension to surround the other, are joined to an intermediate insulating sleeve by means of a low-melting vitreous flux.

1,070,615. Electric Lead for Vapor Electric Apparatus. C. A. Kraus, Newton Highlands, and R. D. Mailey, Lynn, Mass. The cathode lead comprises a hollow foot coextensive with the cathode surface.

1,070,629. Adjustable Field-Rheostat. P. J. Ray, Lakewood, O. Two series of conductor disks are mounted upon rods and maintained in compression by springs.

1,070,638. Control System for Electric Motors. L. H. Thullen, Cincinnati, O. The motor drives a device against resistance of varying value.

1,070,647. Reversible Electric Motor. G. H. Whittingham, assignor to Monitor Manufacturing Co., Baltimore, Md. The field has differential windings, one or both of which may be short-circuited.

1,070,648. Control System for Induction Motors. G. H. Whittingham, assignor to Monitor Manufacturing Co., Baltimore, Md. Two different resistances are connected to the slip-rings for starting and running.

1,070,651. Alternating-Current Regulator. J. J. Wood, Fort Wayne, Ind., assignor to General Electric Co. Comprises a series of cores and coils relatively movable, connected in series.

1,070,663. Guy-Anchor. F. N. Bierce, assignor to The Specialty Device Company, Cincinnati, O. A large base member has a tapering portion and free bodies of a size to effect a wedging action. (See cut.)

1,070,452.—Fusible Cutout.

1,070,673. Electrical Heater. A. Eimer, New York, N. Y. Comprises an electrical resistance and a heat-diffusing support of refractory material which is a non-conductor.

1,070,674. Electric Switch. R. H. Fenkhausen, San Francisco, Cal. A spring-pressed lever is mounted pivotally to engage terminals and is held by a gravity latch. (See cut.)

1,070,726. Harmonic Selective Telephone System. A. F. Poole, Wheeling, W. Va. The signal bell and circuit-controlling device are responsive to currents of different character.

1,070,734. Electric Heat Accumulator. A. Rittershaussen, Cassel, Germany. A closed water vessel has an electric heater near the top with vertical perforations and is inclosed by a poor heat conductor.

1,070,743. Device for Protecting Electric Lines and Apparatus Against Overtension. Stefano de Stefani, Verona, Italy. The line element of a lightning arrester is opposed by a grounded element provided with a series of thin plates of large area.

1,070,769. Arc Light. W. E. Brown, Milwaukee, Wis., and L. C. Granger, Tekonsha, Mich., assignors of one-third to W. M. Stewart, Milwaukee, Wis. The carbon-holding tube has a threaded connection with one bushing and a feathered connection with another.

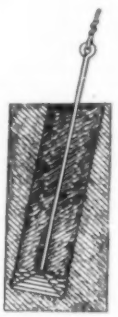
1,070,777. Electric Switch. R. V. Collins, assignor to American Automatic Switch Company, New York, N. Y. The mechanism for operating the switch tongue includes a sealing cup with sides extending above the tongue.

1,070,793. Brush-Holder Attachment for Magnetos. O. Fischer, assignor to Robert Bosch, Stuttgart, Germany. The locking device has co-operative latching mechanism.

1,070,874. Igniting Device for Gas-Engines. R. V. Cornell, Centuria, Wis. A rock shaft extending through the bushing has an electrode on its inner end; a rotatable shaft journaled in the plug has radial contact pins which move the rock shaft.

1,070,883. Target Light for Guns. F. W. Forrester, Los Angeles, Cal. Comprises a lens and an electric lamp supplied by a battery mounted in the stock.

1,070,888. Machine for Operating on Commutators. S. D. Hartog, St. Louis, Mo. A cutter blade is arranged to cut the insulation between the bars of the commutator.



1,070,663.—Guy Anchor.

1,070,893. Mechanical Interrupter for Electric Ignition Systems. G. Honold, assignor to Robert Bosch, Stuttgart, Germany. The actuating cam has a radially acting surface adapted to deform the carrier of one contact.

1,070,899. Cable-Connector. F. Kratz, assignor to Robert Bosch, Stuttgart, Germany. A cylindrical conducting sleeve closely fits the protruding core and extends below the insulation at its base.

1,070,935. Electrical Switch. C. Aalborg, assignor to Westinghouse Electric & Manufacturing Co. A loosely pivoted arm carries non-resilient contact members.

1,070,945. Controlling System for Receiving Apparatus. A. D. Cardwell, New York, N. Y. Groups of working magnets have each an operating circuit and a holding circuit, with means for limiting the current through the latter.

1,070,966. Electric Welding. C. H. Kicklighter, Pasadena, Cal. Means are provided for opposing the self-inductance of the welding current.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 25, 1913:

566,288. Ring-Armature. F. B. Badt and O. S. Lyford, Jr., Chicago, Ill.

566,298. Fac-simile Telegraphy. H. W. C. Cox and R. J. Crowley, London, Eng.

566,313. Self-Winding Electric Clock. E. G. Hammer, Brooklyn, N. Y.

566,334. Apparatus for Registering the Number of Telephonic Conversations. A. Munch, Charlottenburg, Germany.

566,341. Electric Heater. H. O. Rockwell, St. Louis, Mo.

566,345. Trolley-Support for Electric Railways. S. H. Short, Cleveland, O.

566,366. Brush-Holder for Dynamo-Electric Machines. C. E. Woods, Chicago, Ill.

566,373. Inclined Railway. M. H. Brondson, Providence, R. I.

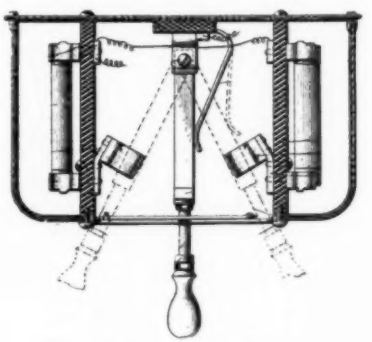
566,397. Electric-Railway Conduit. W. S. Hull, Dallas, Tex.

566,416. Telephonic Apparatus. C. J. Schwarze, Adrian, Mich.

566,426. System of Control for Electric Motors. E. A. Sperry, Cleveland, O.

566,507. Conduit-Outlet Insulator. F. W. Erickson, Revere, Mass.

566,531. Method of Making Secondary or Storage-Battery Plates. W. Petschel, Berlin, Germany.



1,070,674.—Switch.

566,537. Electrical Hammering Machine. T. C. Robinson, Boston, Mass.

566,541. Electric Switch and Signal Apparatus. J. G. Schreuder, Wilkinsburg, Pa.

566,542. Electric Railway. C. Skinner, Chicago, Ill.

566,545. Electric Heating Apparatus. R. A. L. Snyder and A. F. Tinnerholm, Pittsburgh, Pa.

566,564. Electric Heating Apparatus. M. W. Dewey, Syracuse, N. Y.

566,573. Electrical Indicating and cutout Apparatus for Portable or Other Electric Lamps. R. Hacking and G. Brand, Nottingham, Eng.

566,612. Alarm for Boilers. J. O'Connor and C. A. Turner, New York, N. Y.

566,614. Tool for Twisting Electric-Wire Sleeve Connections. S. Olsen, New York, N. Y.

566,652. Arc-Lamp Hanger. W. S. Bosley, Chicago, Ill.

566,693. Electric Rheostat. H. W. Leonard, New York, N. Y.

566,697. Electric Cable Conductor and Sheave Wheel. J. F. Place, Montclair, N. J.

566,714. Switch for Conduit Systems of Electric Railways. J. L. Hornig, St. Louis, Mo.